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GROUNDWATER SAMPLING PLAN
REGIONAL WELLS, MONTROSE SITE
TASK 15
TECHNICAL MEMORANDUM

HARGIS+ASSOCIATES, INC.

GROUNDWATER SAMPLING PLAN
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GROUNDWATER SAMPLING PLAN
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TECHNICAL MEMORANDUM

1.0 INTRODUCTION

Hargis + Associates, Inc. (H+A) has prepared this technical memorandum on behalf of Montrose Chemical Corporation (Montrose) to provide recommendations for sampling of regional wells and to outline regional well sampling procedures. This technical memorandum is being provided in accordance with Task 15, Subtask 5 of Appendix C in the Second Amendment to the Administrative Order on Consent, U.S. Environmental Protection Agency (EPA) Docket No. 85-04.

A summary of operational wells within a 1-mile radius of the Montrose property has been compiled as part of the well inventory for the Regional Hydrogeologic Assessment (Hargis + Associates, Inc., 1990c). Representative operational wells have been selected for groundwater sampling. The purpose of this technical memorandum is to provide a list of wells proposed to be sampled and rationale for their selection, and to outline the proposed sampling procedures. Certain procedures described in the Part 2 Remedial Investigative Work, Phase 2A Groundwater, Soil and Sediment Sampling Plan, Montrose Site, Torrance, California (SAP); Part 2 Remedial Investigative Work Quality Assurance Project Plan, Montrose Site, Torrance, California (QAPP); and the Revised Health and Safety Plan for Soil and Groundwater Investigation at former Montrose Plant Site, Torrance, California (HSP) will be modified to accommodate the differences in well construction, pumping equipment, and additional compounds that may be encountered in these regional wells (Hargis + Associates, Inc., 1988a and Clayton Environmental Consultants, Inc., 1988).

The objective of sampling wells within a 1-mile radius of the Montrose property is to identify the distribution of target chemicals in groundwater that may be related to past activities at the Montrose DDT manufacturing facility. These target chemicals include: total DDT which includes all isomers and metabolites DDD and DDE, total BHC which includes all isomers, chlorobenzene,

dichlorobenzene, benzene, chloroform, and acetone. The data collected from these regional wells will be used to supplement the RI data and may provide additional data to define the nature and extent of contamination at the site. Groundwater samples will be analyzed for target chemicals using EPA Method 624/8240 to analyze volatile organic compounds (VOCs) (Hargis + Associates, Inc., 1988a). The distribution of target chemicals in groundwater has been identified at and in the vicinity of the Montrose property through evaluation of laboratory results of groundwater samples collected from 52 Montrose project monitor wells. The results of laboratory analysis for groundwater samples collected from Montrose project monitor wells demonstrate the immobility of DDT in groundwater. Groundwater samples will not be analyzed for target chemicals using EPA Method 608/8080.

The rationale for the selection of regional wells for sampling is based on three criteria. The first criteria for well selection is to sample wells adequately constructed and screened in intervals consistent with existing Montrose project monitor wells. Montrose project monitor wells are screened in the upper Bellflower aquitard, the Bellflower sand, the Gage aquifer, and the Lynwood aquifer. The majority of non-project wells identified within a 1-mile radius of the Montrose property are screened at the water table in the upper Bellflower aquitard.

The second criterion for selecting regional wells for sampling is to avoid sampling wells which have concentrations of nontarget chemicals which are great enough to mask potential target chemical concentrations. If nontarget chemical concentrations are elevated, sample dilution is required. Sample dilution effectively raises the detection limit for all compounds being analyzed by that method. Compounds occurring at lower concentrations may not be detected in this case. Based on the distribution of target chemicals in RI monitor wells, the regional wells are not expected to contain elevated concentrations of target chemicals. Because of this, collection of groundwater samples from regional wells located in areas known to contain elevated concentrations of nontarget chemicals is not recommended.

The third criteria is to focus primarily on wells located downgradient of the Montrose property. Downgradient well locations are emphasized because target chemicals in groundwater originating from the Montrose property are more likely to occur in the downgradient direction.

Water supply wells are not proposed for sampling because they do not satisfy the first criteria for well selection. Six water supply wells were identified between 2 and 3 miles from the property. Five of these wells are located upgradient to the east and to the north of the property. One water supply well, Dominguez Water Corporation Well No. 19, is located 2 miles downgradient from the property. Dominguez Water Corporation Well No. 19 is screened below the Lynwood aquifer in the Silverado aquifer.

2.0 PROPOSED WELL LOCATIONS

Ten wells within a 1-mile radius of the Montrose property are proposed for sampling (Table 1). The ten wells are located southeast of the Montrose property (Figure 1). The proposed wells are groundwater monitoring or observation wells for subsurface investigations unrelated to the Montrose site investigation.

Six of the proposed wells are located at or in the vicinity of the Royal Boulevard Class III Disposal (Armco) site. One proposed well is located at the Golden Eagle Refining Company (GER) site (Figure 1). Two wells are located in the vicinity of the Del Amo Hazardous Waste site (Del Amo). One well is a Los Angeles County Flood Control District (LACFCD) groundwater observation well located approximately 1 mile southeast of the Montrose property.

Groundwater investigation reports prepared by other consultants have been compiled for the Armco, GER, and Del Amo sites. Well records for LACFCD wells were obtained from Los Angeles County Department of Power and Water (LACDPW).

2.1 ROYAL BOULEVARD CLASS III DISPOSAL SITE

The Armco site is located on Royal Boulevard between 209th and 210th Streets, approximately one-half mile southeast of the Montrose site (Figure 1). A subsurface investigation was conducted at the Armco site by BCL Associates, Inc. in 1986 and 1987 (BCL Associates, Inc., 1987). Soil samples were collected from numerous soil borings for chemical analyses. Twelve 2-inch diameter piezometers and two 4-inch diameter groundwater monitoring wells were constructed to depths of approximately 75 feet below land surface (bls). This depth interval appears to correlate with the upper Bellflower aquitard.

Montrose project monitor well MW-25 is located approximately 350 feet north of the northwest corner of the Armco site. Monitor well MW-25 is screened

locations were not available in the GER reports. Construction of additional monitor wells was proposed in 1986. The current status of the site and extent of additional monitor well construction since 1986 has not been determined.

Recommendations for proposed sampling include collecting groundwater samples from one of the Gage aquifer wells. The final well selection will be determined after receipt and evaluation of additional information requested from the State of California Regional Water Quality Control Board (RWQCB).

2.3 DEL AMO HAZARDOUS WASTE SITE

The Del Amo site is located approximately one-quarter mile southeast of the Montrose property. Subsurface investigations at and in the vicinity of Del Amo site have been conducted by Dames & Moore, Woodward-Clyde Consultants (WCC), and Ecology & Environment, Inc. (Dames & Moore, 1984; Woodward-Clyde Consultants, 1987; Ecology & Environment, Inc., 1983 and 1989).

Several monitor wells screened in the upper Bellflower aquitard were constructed at the Del Amo site. Benzene has been detected at concentrations as high as 750,000 ug/l in groundwater samples collected from monitor wells at the Del Amo site (Ecology & Environment, Inc., 1983 and 1989; Woodward-Clyde Consultants, 1987a). The concentrations of benzene detected in groundwater samples could increase the detection limit for other Montrose target chemical compounds, making detection of Montrose target chemicals less likely.

Monitor well P-3 is located near the intersection of Vermont Street and Del Amo Boulevard at the southeast corner of the Del Amo site. Monitor well P-3 is screened from 85 to 95 feet bls. The results of laboratory analysis using EPA Methods 624 and 625 for a groundwater sample collected from monitor well P-3 in 1987 indicated that acetone, benzene, and ethylbenzene were detected at concentrations of 23, 3, and 1 ug/l, respectively. It is not likely that the concentrations of chemical compounds detected in groundwater samples collected from monitor well P-3 would increase the detection limit for other Montrose

target chemicals. Monitor well P-3 is proposed for sampling. A lithologic log and well construction diagram for monitor well P-3 is presented in Appendix A.

A CERCLA expanded site inspection of the Del Amo site was conducted by Ecology & Environment, Inc. in 1988 under the direction of EPA. The purpose of the inspection was to evaluate exposure pathways for contaminants from the Del Amo site (Ecology & Environment, Inc., 1989).

As part of the CERCLA expanded site inspection, monitor well DA-1B was installed adjacent to the Torrance Lateral near the intersection of Torrance Boulevard and Vermont Streets, approximately three-quarters of a mile southeast of the Montrose property (Figure 1). Monitor well DA-1B is screened from about 210 to 220 feet bls in the lower portion of the Gage aquifer. Monitor well DA-1B is proposed for sampling.

2.4 LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

One LACFCD well is proposed to be sampled. LACFCD groundwater observation well 806C is located approximately 1 mile southeast of the Montrose property near the intersection of Normandie Avenue and 212th Street (Figure 1). LACFCD well 806C was drilled and completed in the Gage aquifer to a total depth of approximately 165 feet bls in 1956. LACFCD well 806C was constructed with 8-inch diameter open ended steel casing. The steel well casing was not perforated. A well data sheet and lithologic log for well 806C prepared by the LACFCD is presented in Appendix A.

3.0 OTHER WELL LOCATIONS

Additional wells within a 1-mile radius of the Montrose property may be proposed for sampling pending receipt and evaluation of reports and information requested from various regulatory agencies. The additional wells are located at or in the vicinity of the Douglas Aircraft C-6 Facility, Trico Industries, AKZO Coatings, Inc. facility, and the Del Amo site (Figure 1).

3.1 DOUGLAS AIRCRAFT C-6 FACILITY

Five monitor wells were constructed at the Douglas Aircraft C-6 Facility in conjunction with a subsurface investigation conducted by WWC in 1987. The monitor wells were installed to depths of approximately 90 feet bls to evaluate groundwater conditions in the vicinity of underground storage tanks at the facility. This depth interval appears to correlate with the upper Bellflower aquitard. VOCs including trichloroethene (TCE), dichloroethene (DCE), and tetrachloroethene (PCE) were reportedly detected in groundwater samples collected from each of the five monitor wells (Woodward-Clyde Consultants, 1988a and b).

WCC recommended in their Phase III work plan the installation of up to 17 additional monitor wells (Woodward-Clyde Consultants, 1989). Nine of the additional wells were to be constructed to depths of approximately 95 feet bls. Six of the wells were to be constructed to depths of approximately 150 feet bls. One of the monitor wells was to be screened in the Gage aquifer to a depth of approximately 200 feet bls.

WCC also recommended the installation of a 6-inch diameter recovery well, screened through the Bellflower aquitard to a total depth of approximately 150 feet bls. Aquifer tests were proposed in the Douglas Aircraft Company Torrance (C6) Facility, Phase III Ground Water and Soil Investigation Work Plan

including a 48-hour pump test to be conducted in the recovery well (Woodward-Clyde Consultants, 1989).

According to McDonnell Douglas Corporation, the tasks proposed in the work plan have been completed (Hargis + Associates, Inc., 1990a). Presently, the data are being evaluated and will be presented in a summary report being prepared for the RWQCB.

Monitor wells screened in each of the hydrogeologic units may be proposed for sampling at the Douglas Aircraft C-6 Facility pending evaluation of the results of field work being conducted.

3.2 AKZO COATINGS

The AKZO Coatings, Inc. (AKZO) facility is located at 20846 S. Normandie Avenue approximately one-half mile southeast of the Montrose property (Figure 1). Subsurface investigations at the AKZO facility have been conducted by ENSR Constructors, D'Appalonia and other consultants. The purpose of the investigations was to characterize soil and groundwater contamination in the vicinity of 17 underground storage tanks located at the facility.

Four monitoring wells were reportedly constructed at the site. Well construction specifications for the four monitoring wells were not available. The results of laboratory analysis for groundwater samples collected from monitor wells reportedly indicated that acetone, benzene, DCE, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, toluene, and xylenes were detected in groundwater beneath the facility (ENSR Constructors, 1989a and b).

Additional reports have been requested from the RWQCB. Upon receipt, the reports will be evaluated to determine monitor well construction specifications and the results of water quality analyses for each well. These data will be used to determine if groundwater sampling will be proposed for wells at the AKZO site.

3.3 TRICO INDUSTRIES

Two monitor wells were reportedly installed at Trico Industries located at 19706 Normandie Avenue (SCS Engineers, 1988). Soil to a depth of at least 40 feet bls and groundwater encountered at about 85 feet bls are reportedly contaminated with chlorinated hydrocarbons, benzene, toluene, ethylbenzene, xylenes, chloroform, and diesel fuel. This site is being investigated under the direction of the RWQCB (Hargis + Associates, Inc., 1990b).

Upon receipt and evaluation of additional information requested from the RWQCB, the collection of groundwater samples from monitor wells at Trico Industries may be proposed.

3.4 LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

LACFCD groundwater observation Well No. 805 is reportedly located near the intersection of Vermont Avenue and Torrance Boulevard, approximately two-thirds of a mile southeast of the Montrose property (Figure 1). LACFCD Well No. 805 was reportedly constructed with 7-inch diameter steel casing installed to approximately 100 feet bls.

Lithologic logs, well construction specifications, precise location, and current status for LACFCD well 805 were not available upon request. If these well data become available, LACFCD Well No. 805 will be evaluated for possible sampling. This well may have been abandoned.

4.0 OBTAINING ACCESS AND SITE INSPECTIONS

4.1 ACCESS TO PROPERTIES

Implementation of the proposed groundwater sampling will require permission to access the properties. Upon approval of this technical memorandum by EPA, Montrose will submit written access requests to the owners of wells proposed for sampling. Negotiation of terms and conditions for access may impact the proposed sampling schedule and methodologies.

4.2 SITE INSPECTIONS

If access is obtained, site inspections will be conducted prior to implementation of the proposed sampling program. The purpose of the site inspections will be to update information about each site and to evaluate conditions that may affect the proposed sampling methodologies.

Site inspections will include evaluation of well accessibility, well head conditions, and configuration of existing pump installations. Depth to water and depth to bottom measurements will be taken in each well. Casing diameters will be measured and recorded. Power supply requirements for sampling equipment will be determined. Provisions for the containment of purge water will be evaluated. These data will be used to determine sampling methodologies for collecting groundwater samples from each well.

4.3 BACKGROUND INFORMATION

Additional background information including drilling and construction specifications, hydrogeologic data, and water quality data for each well will be tabulated prior to implementation of this sampling program. Background

information will be used as criteria to determine sampling methodologies for each well.

Forms have been prepared to record and document background information for each well prior to sampling (Appendix B). Hydrogeologic data from each well will include water level elevations and pumping characteristics. Water quality data will include a summary of concentrations of chemical constituents previously detected in groundwater samples collected from each well.

Water quality data will be evaluated to determine potential laboratory analytical interferences that may affect detection limits for target chemicals in groundwater samples containing high concentrations of other chemical constituents. Water quality data will also be used to determine modifications required to the HSP as discussed in Section 9.0.

5.0 WATER LEVEL ELEVATIONS

Water level elevations will be measured in all regional wells proposed for groundwater sampling. If access can be obtained, water level elevations will be measured in selected additional wells which are not proposed for sampling. Water level elevation data for all LACFCD groundwater observation wells within a 1-mile radius of the Montrose property will be compiled from records kept by the LACDPW.

5.1 WATER LEVEL ELEVATION MEASUREMENTS

Water level elevations will be measured in accordance with protocol established in Section 6.2, page 34 of the QAPP. Water level elevation data will be compiled for each hydrogeologic unit and used in conjunction with water level elevation data collected from Montrose project monitor wells to evaluate directions of groundwater movement in each unit.

6.0 GROUNDWATER SAMPLING

6.1 SELECTION OF GROUNDWATER SAMPLING EQUIPMENT

Groundwater sampling equipment will be selected on a well-specific basis. The criteria used to determine sampling equipment for each well include existing pump installations, casing diameter, and expected well yield.

6.1.1 Existing Pump Installations

Groundwater samples will be collected using existing pump installations for all wells equipped with dedicated pumps. Sampling methods outlined in the SAP and QAPP will be followed where applicable. For collection of groundwater samples from wells with existing pump installations, the potential volatilization of organic constituents will be minimized by controlling pump discharge rates where possible.

6.1.2 Casing Diameter Limitations

Well casing diameter may limit the selection of sampling equipment for wells where permanent pump installations do not exist. Wells with 2-inch diameter casing will be purged and sampled using either nondedicated bailers or bladder pumps. Wells with 4-inch or greater diameter casing will be purged prior to sample collection using either nondedicated electric submersible pumps, bladder pumps, or bailers. Electric submersible pumps will be used to purge large volumes of water from wells capable of sustaining the discharge specifications of the pump. Groundwater samples will be collected using non-dedicated bladder pumps.

6.2 GROUNDWATER SAMPLE COLLECTION

Groundwater samples will be collected in accordance with protocols established in Section 5.3.1 of the QAPP and with procedures outlined in this section. Groundwater samples will be analyzed for target chemicals using EPA Method 624/8240.

Sampling methods for collection of groundwater samples from wells using nondedicated sampling equipment are discussed in this section. Decontamination procedures for nondedicated sampling equipment are outlined in Section 6.3.

6.2.1 Bladder Pumps

To provide consistency with existing sampling methods at the Montrose site bladder pumps will be used as the preferred method for collection of groundwater samples from the proposed regional wells. Bladder pumps are easily installed in well casings with diameters of two inches or more. Procedures for collection of groundwater samples with bladder pumps are outlined in the QAPP. Nondedicated bladder pumps will be decontaminated before each use.

A limitation to the use of bladder pumps is the low rate of discharge for purging large volumes of water from wells. Alternatives for purging large volumes of water from wells prior to sampling include electric submersible pumps and bailers. Another limitation to the use of bladder pumps is the requirement for pump submergence. To collect groundwater samples from wells where bladder pump submergence is inadequate, bailers will be used as an alternative.

6.2.2 Electric Submersible Pumps

In wells where large volumes of water must be purged prior to sampling, an electric submersible pump will be installed. The pump will be suspended from a stainless steel cable attached to a tripod winch. A length of flexible hose

or tubing will be used to carry purge water from the pump to the land surface. The pump and discharge tubing will be lowered into the well and used to purge the well prior to sampling.

Groundwater samples will be collected using a bladder pump installed above the electric submersible pump. Pumps, cables, and tubing will be decontaminated prior to each use.

6.2.3 Bailers

The use of bailers to purge and sample wells may be required for low yielding wells unable to sustain electric submersible pump discharge rates or where bladder pump submergence is inadequate. If bailers are used, they will be decontaminated prior to each use. Because a number of the proposed wells are constructed with PVC screen, bailers used for purging and sampling wells will be constructed of PVC. Groundwater samples collected with bailers will be transferred to sample containers using a bottom emptying device attached to the bailer body.

Bailing procedures will be conducted to minimize splashing and the potential for volatilization of organic compounds. The bailer suspension cord will not be permitted to contact the ground during the course of bailing water from wells.

6.3 DECONTAMINATION PROCEDURES

The decontamination procedures to be implemented for nondedicated groundwater sampling equipment are outlined in this section.

6.3.1 Bladder Pumps

Prior to each use, bladder pumps will be decontaminated using the following procedures:

- Dismantle pump, remove bladder;
- Decontaminate pump, bladder, and exterior of discharge tubing in accordance with procedures in Section 5.3.2, page 19 of the QAPP;
- Reassemble pump;
- Calculate and record the volumetric capacity of pump and discharge tubing;
- Circulate a volume of nonphosphate soapy water equivalent to five times the volumetric capacity through pump and discharge tubing;
- Circulate a volume of tap water equivalent to five times the volumetric capacity through pump and discharge tubing; and
- Circulate a volume of distilled water equivalent to five times the volumetric capacity through pump and discharge tubing.

6.3.2 Electric Submersible Pumps

Electric submersible pumps used to purge water from wells prior to sampling will be decontaminated using the following procedures:

- Decontaminate exterior of pump discharge tubing and suspension cable in accordance with procedures outlined in Section 5.3.2, page 11 of the QAPP;

- Calculate and record the volumetric capacity of pump and discharge tubing;
- Circulate a volume of non-phosphate soapy water equivalent to five times the volumetric capacity through pump and discharge tubing; and
- Circulate a volume of tap water equivalent to 10 times the volumetric capacity through pump and discharge tubing.

6.3.3 Bailers

Bailers will be decontaminated in accordance with the procedures outlined on Section 5.3.2, page 19, of the QAPP.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) procedures are outlined in Section 5.3.1, page 13 and Section 11, page 47 of the QAPP.

Use of nondedicated sampling equipment to collect groundwater samples will require collection of equipment rinsate samples. Equipment rinsate sample collection is described in Section 5.3.2, page 20 of the QAPP. One equipment rinsate sample will be collected each day.

QA/QC procedures include provisions for collection of EPA split, laboratory split, and field duplicate samples. Preparation of field blank and trip blank samples are also included.

Locations for the collection and preparation of QA/QC samples will be determined prior to commencing field work pending final selection of wells to be sampled.

8.0 HANDLING AND DISPOSAL OF WATER

Groundwater generated from this phase of sampling will be containerized at each location. Containment, treatment, and disposal options may be available at some sites. Pursuant to terms and conditions of access agreements, groundwater generated during this phase of sampling will be handled in accordance with existing policies and procedures implemented for each site. If these options are not available, containerized groundwater will be transported back to the Montrose property. Groundwater transported back to the Montrose property will be handled in accordance with Sections 5.3.2, page 20 and 5.6.1, page 29 of the QAPP.

Washwater generated from decontamination procedures will be containerized, transported back to the Montrose property and handled in accordance with Section 5.3.2, page 20 of the QAPP.

9.0 HEALTH AND SAFETY REQUIREMENTS

Field data and analytical results for soil and groundwater will be evaluated for each site to determine if health and safety considerations require additional modifications to the HSP.

A list of chemicals previously detected in groundwater samples collected from each well will be compiled. The concentrations of chemical constituents not already incorporated into the HSP will be evaluated to identify primary hazards and exposure limits for each constituent. These data will be incorporated into the HSP.

The HSP provides guidelines for personal protection and monitoring for potential hazards from a wide variety of chemical constituents and concentrations.

It is anticipated that the scope of this task will not necessitate significant modifications to the HSP and its amendments.

10.0 SCHEDULE AND DELIVERABLES

Upon EPA approval of this technical memorandum, written access requests will be submitted within two weeks to the owners of wells proposed to be sampled. After receipt of access, site inspections will be scheduled within approximately four weeks.

A sampling schedule will be prepared approximately two weeks following completion of site inspections. Groundwater samples will be collected within approximately two weeks after the sampling schedule is prepared.

A field data submittal will be made within 30 days after completion of this sampling program. Analytical results for groundwater samples collected during this sampling program will be submitted to EPA within 45 days after completion of field sampling activities.

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Tables

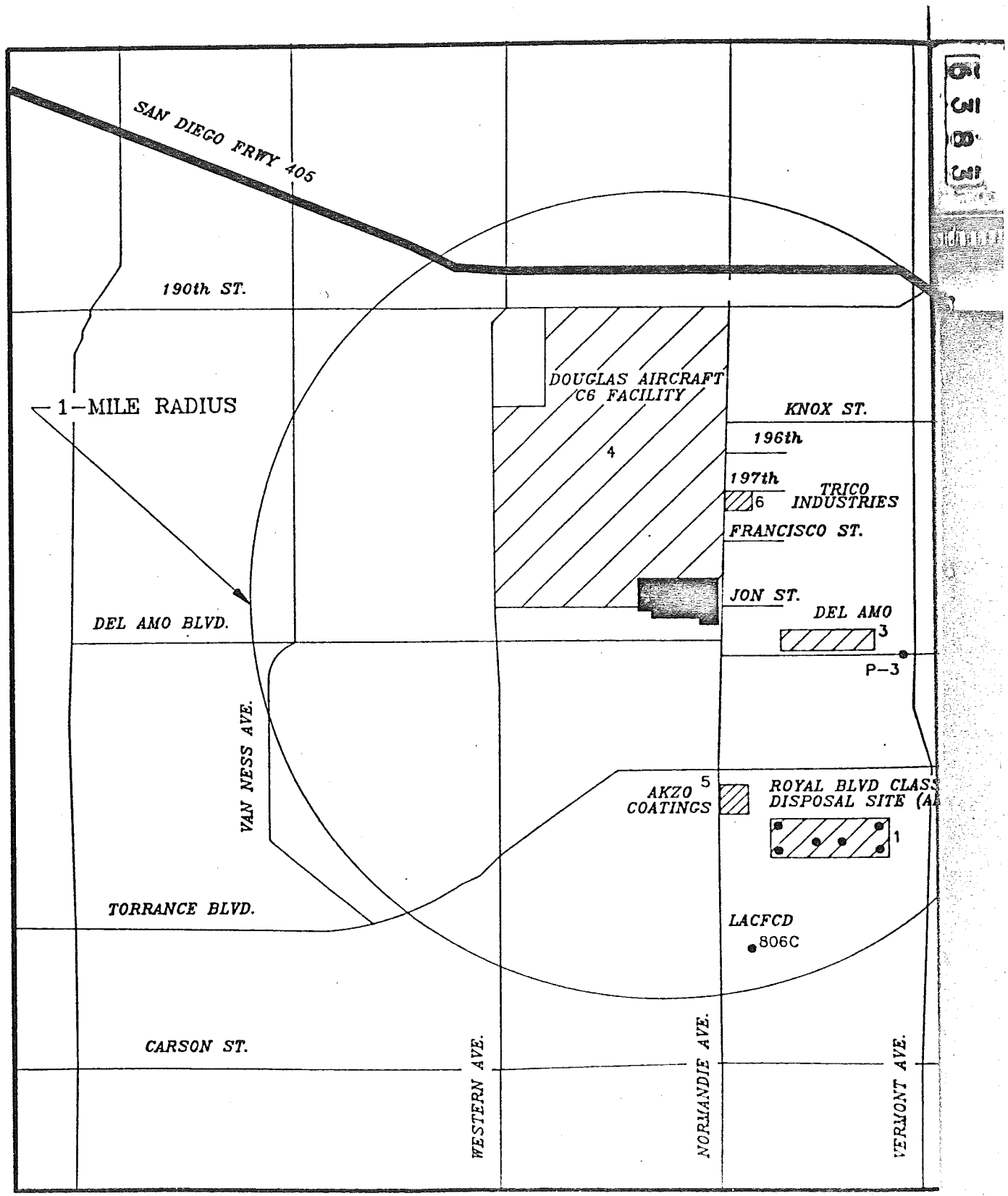
TABLE 1

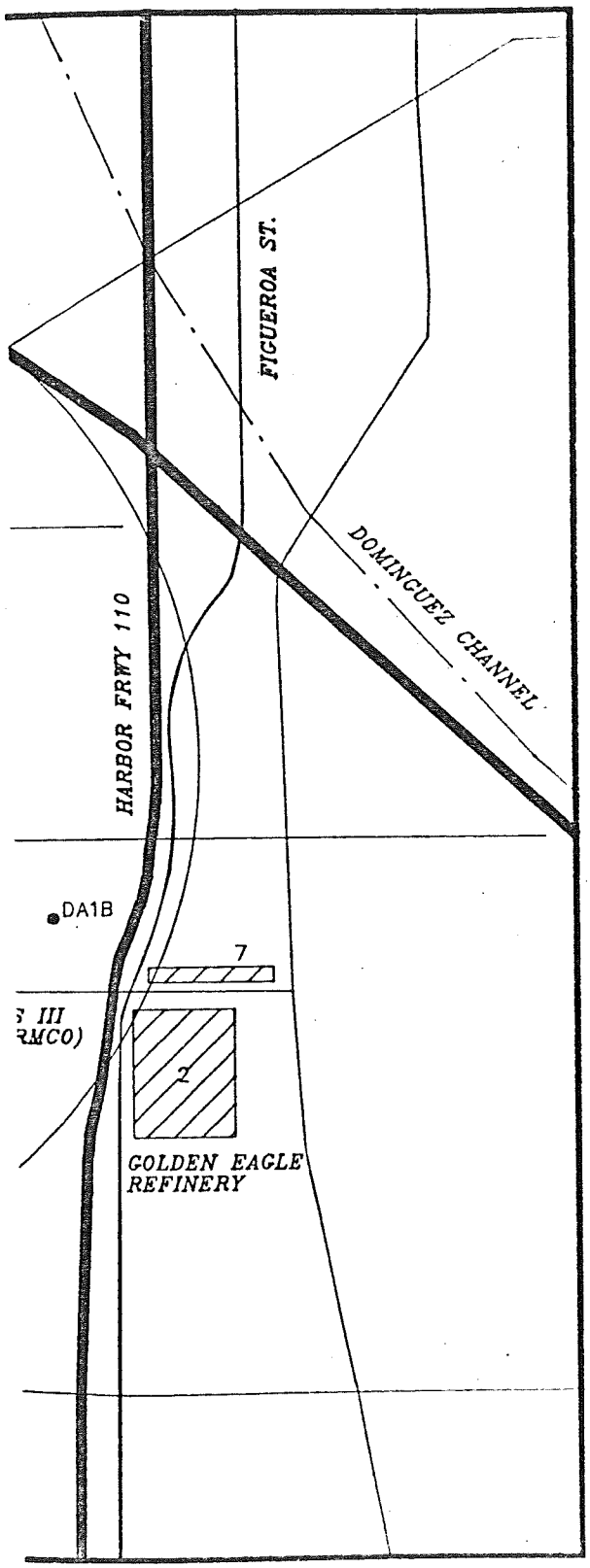
WELLS PROPOSED FOR GROUNDWATER SAMPLING

WELL LOCATION	WELL IDENTIFIER	SCREENED INTERVAL (feet bls)	HYDROGEOLOGIC UNIT	CASING DIAMETER (inches)	SAMPLING METHODOLOGY
Armco Royal Boulevard	B-27	57-72	Bellflower Aquitard	4	ESP/Bladder/Bailer
	B-28	57-72	Bellflower Aquitard	4	ESP/Bladder/Bailer
	B-17	65-70	Bellflower Aquitard	2	Bladder/Bailer
	B-20	60-65	Bellflower Aquitard	2	Bladder/Bailer
	B-23	60-65	Bellflower Aquitard	2	Bladder/Bailer
	B-26	60-65	Bellflower Aquitard	2	Bladder/Bailer
Golden Eagle Refining Company	MW-12*	141-190	Gage Aquifer	6	ESP/Bladder
	MW-13D	139-188	Gage Aquifer	6	ESP/Bladder
LACFCD**	806C	165**	Gage Aquifer	8	ESP/Bladder
Del Amo Vicinity	P-3	85-95	Bellflower Aquitard	4	Bladder/Bailer
	DA-1B	210-220	Lower Gage Aquifer	4	ESP/Bladder

* Either MW-12D or MW-13D will be sampled
**LACFCD = Los Angeles County Flood Control District
bls = Below land surface
ESP = Electric submersible pump to purge
Bladder = Bladder pump

Illustrations


SAN DIEGO FRWY 405
190th ST.
1-MILE RADIUS
DOUGLAS AIRCRAFT
C6 FACILITY
4
KNOX ST.
196th
197th
6
TRICO
INDUSTRIES
FRANCISCO ST.
JON ST.
DEL AMO
3
P-3
DEL AMO BLVD.
VAN NESS AVE.
5
AKZO
COATINGS
ROYAL BLVD CLASS
DISPOSAL SITE (A
1
TORRANCE BLVD.
LACFCD
806C
CARSON ST.
WESTERN AVE.
NORMANDIE AVE.
VERMONT AVE.



EXPLANATION

MONTROSE PROPERTY

LACFCD 808C — APPROXIMATE LOCATION OF PROPOSED GROUNDWATER SAMPLING WELL

APPROXIMATE LOCATION OF SITES PROPOSED FOR GROUNDWATER SAMPLING

1. ROYAL BLVD CLASS III DISPOSAL SITE (ARMCO)
2. GOLDEN EAGLE REFINERY
3. DEL AMO HAZARDOUS WASTE SITE
4. DOUGLAS AIRCRAFT C6 FACILITY
5. AKZO COATING AMERICA
6. TRICO INDUSTRIES
7. GARDENA VALLEY LANDFILL #1 & 2

0 1,500 3,000
FEET

MONTROSE SITE
LOS ANGELES, CALIFORNIA

LOCATION OF PROPOSED GROUNDWATER SAMPLING WELLS

HARGIS + ASSOCIATES, INC.

3/90

FIGURE 1

PREPARED BY WTN REVIEWED BY RAN

APPENDIX A

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... ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PROJECT NAME Royal

PROJECT NUMBER 85-273

BORING DESIGNATION B-27

BORING LOCATION Royal. East Property.	DATE STARTED 10-22-86	DATE FINISHED 10-23-86
DRILLER Beylik (Tom. Condrey).	COMPLETION DEPTH (FT) 75	NUMBER OF SAMPLES Soils 16 Fluids 4
DRILLING EQUIPMENT Mobile Drill. B-61- H.S.A.	ELEVATION AND DATUM	WATER DEPTH (FT) 1st water at ≈ 63'
DIAMETER AND TYPE OF WELL CASING 8" Pilot Hole. 12" Well.	LOGGED BY Rod. Lazo	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME	PPM FID	PPM PID	REMARKS (Background FID. PID)
0	A.F.D.	Fill. (w) Black (5Y 2.5/2). Foundry sand. w/ some debris. Moist ≈ 10%	GW1-0	10-22	0825	9	<0	9 2 Fill. foundry sand.
		Clay (w) Dark olive gray (5Y 3/2) clayey soil. Mod. compacted. clean. Moisture ≈ 12%	GW1-2.5	10-22	0830	10	2.2, <0	9 2 clayey soil - clean
5		Clay, as above.	GW1-5	10-22	0835	9.5	<0	9 2 clayey soil - clean
10	CL	Clay (w) olive yellow (5Y 6/8). Silty clayey soil. Mod. compacted. Moisture ≈ 10%	GW1-10	10-22	0842	9.5	<0	9.5 2 Clean - clay
15		Clay, as above.	GW1-15 Soils Sample.	10-22	0850			Clean clay.
		Sand (w) olive yellow (2.5Y 6/8). Fine to very fine sand. loose. Moisture ≈ 12%	GW1-17.5	10-22	0855	9	<0	9 2 Clean sand.
20	CL	Clay. Sandy clay (w) olive yellow (2.5Y 6/8). Oxidation streaks.	GW1-20	10-22	0900	9	<0	9 2. Sandy clay - clean
		Sand (w) light olive brown (2.5Y 5/6) fine sand w/ some silt.	GW1-22.5	10-22	0905	9	<0	9 2.6 Sand - clean.
25	SM	Sand, as above.	GW1-25	10-22	0910	9	<0	9 2 Sand - clean.
		Sand, as above.	GW1-27.5	10-22	0913	9.5	<0	8.5 2 Sand - clean
30		Silt - clayey silt (w) pale olive (5Y 6/4). Mod compacted silt. w/ traces of oxidation. Moist ≈ 10%	GW1-30 Soils Sample	10-22	0925			clayey silt - clean
35	ML	Silt - clayey silt, as above	GW1-35	10-22	920	8.5	<0	8.5 2.4 clayey silt - clean
40	SP	Sand (w) olive yellow (2.5Y 6/8) fine to very fine, loose sand. Moisture ≈ 10%	GW1-40	10-22	927	8	<0	8 2.0 Clean sand.
45								

FIGURE A-1

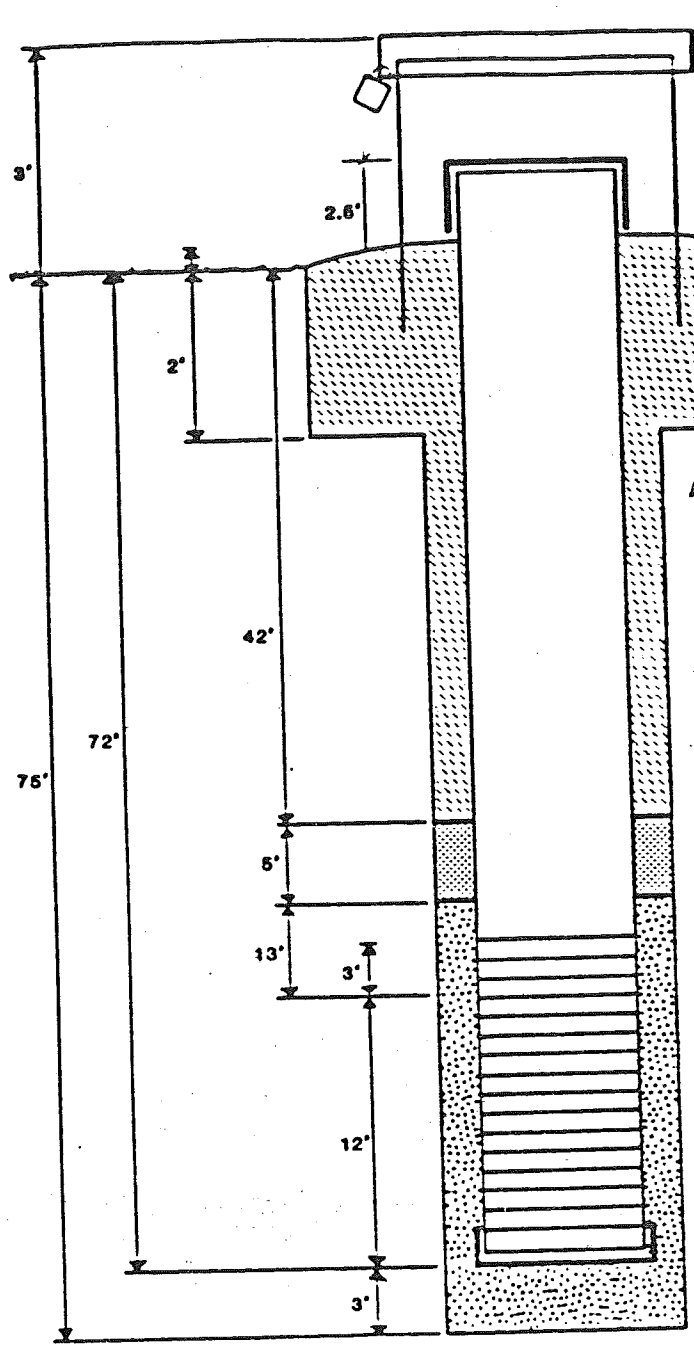
SCL ASSOCIATES, INC. **BORING LOG AND SAMPLING RECORD** PAGE 2 OF

PROJECT NAME: Royal
PROJECT NUMBER: 85 273
BORING DESIGNATION: B-27

BORING LOCATION: Royal · East Property	DATE STARTED: 10-22-86	DATE FINISHED: 10 23-8
DRILLER: Beylik. (Tom · Condrey).	COMPLETION DEPTH (FT): 75'	NUMBER OF SAMPLES: Bckg. 10 / 8 soils
DRILLING EQUIPMENT: Mobile Drill · B-61 · H.S.A.	ELEVATION AND DATUM:	WATER DEPTH (FT): 12" water at ≥ 60'
DIAMETER AND TYPE OF WELL CASING: 8" pilot hole · 12" well ·	LOGGED BY: Rod Lai ·	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME	PPM. ID.	PPM. FID	REMARKS (Background: ID. FID.)
45	SM	Sand(w) light olive brown (2.5Y 5/6) fine sandy fine silty sand · Mod. compacted. moisture ≥ 12%.	GW1-45. Soil sample	10-22	930			Clean. Silty sand
50	CL	Clay(w) pale olive (5Y 6/4). Mod. compacted. clay. w/ some silt · moisture ≥ 10%	GW1-50	10-22	935	3	<0	3 20 Clay · Clean
55	SM	Sand(w) olive (5Y 5/6). fine sand w/ some silt · poorly graded moisture ≥ 12% ·	GW1-55	10-22	940	7	<0	7 2.2 Sand - Clean ·
60 ▽	SP	Sand(w) pale olive (5Y 6/3). Medium sand · poorly graded · loose · water saturated ·	GW1-60 Soils sample	10-22	950			Sand - clean. wa
65		Sand. as above ·	GW1-65 ·	10-22	952	7	<0	4 1.6 Sand, clean-wat
70		Sand, as above ·	GW1-70	10-22	1000	6	<0	4 1.6 Sand. clean. wat
75 TD		Sand, as above ·	GW1-75	10-22	10.05	7	<0	4 1.6 Sand. clean-wat

FIGURE A-1 CONT



PROTECTIVE CASING WITH LOCKING CAP

VENTED WELL-CAP TYPE: PVC

GROUND SURFACE

DIAMETER OF SURFACE SEAL: 2'

MATERIAL: CONCRETE

ANNULAR SPACE
FILL: CEMENT GROUT
SEAL:

WELL CASING
MATERIAL: PVC
DIAMETER: 4 INCHES
LENGTH: 59.5 FEET

SEAL
MATERIAL: BENTONITE

▽ 60'

SCREEN
MATERIAL: STAINLESS STEEL
SLOT SIZE: 0.020 INCHES
LENGTH: 15 FEET

FILTER PACK
MATERIAL: MONTEREY SAND NO. 3
DIAMETER: 12 INCHES

CAP

BOREHOLE
DIAMETER: 12 INCHES

BCL	Source: BCL ASSOCIATES, INC.	Title: ARMCO INC. ROYAL BLVD. B-27 GROUNDWATER WELL CONSTRUCTION

FIGURE A-2

BCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PROJECT NAME: Revel

PROJECT NUMBER: 85-273

BORING DESIGNATION: B-28

BORING LOCATION: South eastern corner of west property.	DATE STARTED: 10-23-86	DATE FINISHED: 10-23-86
DRILLER: Boyle (Tom Conboy)	COMPLETION DEPTH (FT): 75	NUMBER OF SAMPLES: BCLA [illegible] / P. Soils 4
DRILLING EQUIPMENT: Mobile Drill B-61. H.S.A.	ELEVATION AND DATUM:	WATER DEPTH (FT): 1st water at ≈ 60'
DIAMETER AND TYPE OF WELL CASING: 8" pilot hole, 12" well.	LOGGED BY: Ron Lozo.	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME	PPM STD.	PPM PID	REMARKS (Background STD, PID)
0		Fill · Dry · Foundry sand w/ debris (concrete - slag) · Bluish ·	GW2-0	10-23	1300	6	4.2	6 4.2 Fill.
		Fill as above	GW2-2.5	10-23	1310	6	2	6 2.4 Fill.
5		Fill · as above	GW2-5	10-23	1315	6	<0	6 2.4 Fill.
	Fill	Fill. Bluish foundry sand w/ slag and pebbles (bricks, concrete). Loose. Moisture ≈ 10%	GW2-7.5	10-23	13.20	7	<0	6 2.4 Fill.
10		Fill as above w/ bricks	GW2-10	10-23	13.25	6	<0	6 2 Fill
			NS					No recovery. PVC. Bricks.
15			NS					No recovery.
		Clayey silt (ML) dark olive (5Y-3) moderately compacted and sticky. Moisture ≈ 12%	GW2-16 soils sample	10-23	1330	-	-	Only close no samples
			NS					No recovery.
20		Sand (SM) olive (5Y 5/4). Fine silty clayey sand. Mod. compacted. Moisture ≈ 12%	GW2-20	10-23	1340	7	<0	1.8 Sand. clean.
	SM	Sand as above.	GW2-22.5	10-23	1345	7	1.8	7 1.8 Sand clean.
25		Sand, as above	GW2-25	10-23	1347	6.6	1.8	6.6 1.8 Sand, clean
		Sand (SM) olive yellow. Fine to very fine silty sand. Moist ≈ 12% (2.5Y 6/8)	GW2-27.5	10-23	1350	6.6	1.4	6.6 2 Sand, clean.
30		Sand, as above	GW2-30 soils sample	10-23	1354			Sand, clean
	SM	Sand, as above	GW2-32.5	10-23	1356	6.5	<0	6.5 2 Sand, clean
35		Sand, as above	GW2-35	10-23	1400	6.5	2	6.5 2 Sand, clean
40		Sand (SP) olive yellow (2.5Y 6/2). Fine to very fine sand, clean, loose. Moisture ≈ 12%	GW2-40	10-23	1402	6.5	2	6.5 2 Sand, clean
45	SP		GW2-45 soils sample					

NS = No sample

FIGURE A-3

BOE-C6-0184816

BCL ASSOCIATES, INC. BORING LOG AND SAMPLING RECORD

PROJECT NAME: Coral

PROJECT NUMBER: 85-273

BORING DESIGNATION: B-28

BORING LOCATION: South-eastern corner of west property	DATE STARTED: 10-23-86	DATE FINISHED: 10-23-86
DRILLER: Beylik (Tom Condrey)	COMPLETION DEPTH (FT): 75	NUMBER OF SAMPLES:
DRILLING EQUIPMENT: Mobile Drill B-61 H.S.A.	ELEVATION AND DATUM:	WATER DEPTH (FT): 1st water ≈ 60'
DIAMETER AND TYPE OF WELL CASING: 8" pilot hole, 12" well.	LOGGED BY: Rob Low	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME	PPM FID	PPM PID	REMARKS
45	SP	SAND (w) olive yellow (2.5Y 6/8). Fine to very fine sand. Clean, loose. Moisture ≈ 12%.	GW2-45 soils sample	10-23	1405			Sand. Clean.
50	CL	Clay (w) pale olive (5Y 6/3) mod. compacted & sticky silty clay. Moisture ≈ 10%	GW2-50	10-23	1415	6.5	2	6.5 2 Clay. Clean.
55		Clay. As above.	GW2-55	10-23	1420	6.2	2	6.2 2 Clay. Clean
60			NS.					No recovery
	SP	SAND (w) olive (5Y 5/6) medium sand, poorly graded, water saturated, loose.	GW2-61 soils sample	10-23	1435			Sand. Water
65		Sand, as above.	GW2-65	10-23	1442	5.8	2	5.8 2 Sand. Water.
70		Sand, as above.	GW2-70	10-23	1445	6	2	6 2 Sand, as above.
75 TD		Sand, as above.	GW2-75	10-23	1450	5.9	2	5.8 2

FIGURE A-3 CONT.

BOE-C6-0184817

BCL ASSOCIATES, INC. — BORING LOG AND SAMPLING RECORD — PAGE 1 OF 2

PROJECT NAME Royal
PROJECT NUMBER 85-273 — BORING DESIGNATION B-17

BORING LOCATION NW. Corner of West property.	DATE STARTED 6-12-86	DATE FINISHED 6-12-86
DRILLER Boylik.	COMPLETION DEPTH (FT) 70	NUMBER OF SAMPLES —
DRILLING EQUIPMENT H. Diam B-61. N.C.A.	ELEVATION AND DATUM	WATER DEPTH (FT) ≈ 60'
DIAMETER AND TYPE OF WELL CASING 6" Pilot hole 12" (reamed).	LOGGED BY Rod. Law.	Litho. logs were prepared from drilling cuttings only

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
		fill. "SAND" soil. V. dark brown. w/ sand & brick chips. moisture ≈ 10%					
5	fill	fill, as above.					fill.
10	fill	fill, as above.					fill.
15		clay. w/ dark greyish brown sandy clay. Black-stained. moisture ≈ 18%.					clay. (Stained.)
20		clay (w) dark olive. well compacted & sticky. moisture ≈ 12%					clay. clean.
		clay as above.					clean clay.
30		clay, as above.					clean clay.
35		clay as above.					clean clay
40		clay (w) olive. very stiff and plastic, well compacted. moisture ≈ 12%.					clean clay
45							

FIGURE A-5

BCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PAGE 2

PROJECT NAME Royal.

PROJECT NUMBER 95-273

BORING DESIGNATION B-17

BORING LOCATION	N.W. CORNER OF WEST PROPERTY.	DATE STARTED	6.12.8.	DATE FINISHED	6.
DRILLER	Bayliss.	COMPLETION DEPTH (FT)	70	NUMBER OF SAMPLES	
DRILLING EQUIPMENT	MOBILE DRILL B-61. H.S.A.	ELEVATION AND DATUM		WATER DEPTH (FT)	≃
DIAMETER AND TYPE OF WELL CASING	6" PILOT HOLE 12" (Reamed)	LOGGED BY	Rod. Lazo	LITHO-LOG WERE PO FROM DRILLING CUTTIN	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARK
45		Clay(CL) OLIVE. VERY STICKY AND PLASTIC, WELL COMPACTED. MOISTURE ≃ 12%					CLEAN CL.
	?	— — ?— ?— ? — -					
50		SAND W/ FINE TO V. FINE SAND. OLIVE. (5Y 5/6). CLEAN, MOIST ≃ 15%.					clean S.
55	SP	SAND, AS ABOVE					clean S
60		SAND W/ FINE TO V FINE OLIVE SAND (5Y 5/6) LOOSE. CLEAN. MOISTURE ≃ 20%.					Clean SA Very moist
65		SAND. AS ABOVE but water saturated.					clean S. WATER SATU
70		SAND AS ABOVE WATER SATURATED					clean S. WATER SATU
TD							

FIGURE A-5 CONT

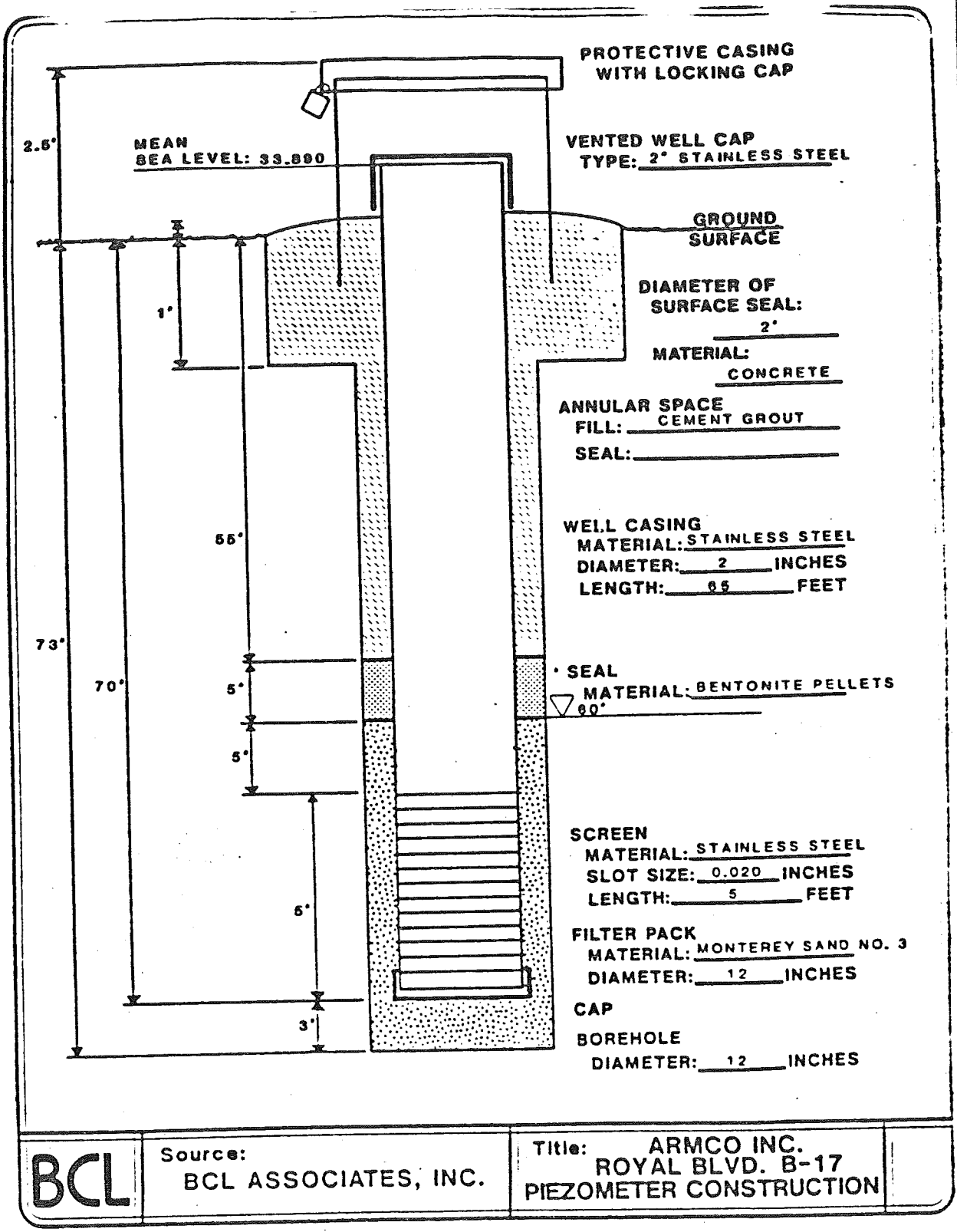

PROTECTIVE CASING
WITH LOCKING CAP
VENTED WELL CAP
TYPE: 2" STAINLESS STEEL
2.5'
MEAN
SEA LEVEL: 33.890
GROUND
SURFACE
1'
DIAMETER OF
SURFACE SEAL:
2"
MATERIAL:
CONCRETE
ANNULAR SPACE
FILL: CEMENT GROUT
SEAL:
55'
WELL CASING
MATERIAL: STAINLESS STEEL
DIAMETER: 2 INCHES
LENGTH: 65 FEET
73'
70'
5'
SEAL
MATERIAL: BENTONITE PELLETS
60'
5'
5'
SCREEN
MATERIAL: STAINLESS STEEL
SLOT SIZE: 0.020 INCHES
LENGTH: 5 FEET
FILTER PACK
MATERIAL: MONTEREY SAND NO. 3
DIAMETER: 12 INCHES
3'
CAP
BOREHOLE
DIAMETER: 12 INCHES
BCL
Source:
BCL ASSOCIATES, INC.
Title: ARMCO INC.
ROYAL BLVD. B-17
PIEZOMETER CONSTRUCTION

FIGURE A-6

BCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PROJECT NAME: Royal
PROJECT NUMBER: 85-273
BORING DESIGNATION: B-20

BORING LOCATION: SW. Corner of West. Property	DATE STARTED: 6-13-86	DATE FINISHED: 6 13 86
DRILLER: Beylik Drilling Inc.	COMPLETION DEPTH (FT): 65	NUMBER OF SAMPLES: —
DRILLING EQUIPMENT: M. Drill B. 61. H.S.A	ELEVATION AND DATUM:	WATER DEPTH (FT): 12" water ≃ 58'
DIAMETER AND TYPE OF WELL CASING: 6" Auger. Pilot hole 12" Reamed (well)	LOGGED BY: Rod Lew.	Litho-logic were recorded from drilling cuttings only.

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
0		Sand (w) Light olive brown (2.5Y 5/4) fine silty sand. moisture ≃10%					clean sand
5	SM	Sand (w) olive brown clayey silty sand. Not compacted. Moist ≃12%					clean sand
10		Sand as above					clean sand
15		Sand as above					clean sand
20							clean sand
25		Sand as above.					clean sand.
30	SM	Sand (w) Pale blue (5Y 6/2) silty clayey fine sand moisture ≃12%					clean sand
35		Sand. as above					clean sand.
40							

FIGURE A-7

BCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PROJECT NAME Power

PROJECT NUMBER 95 273

BORING DESIGNATION B-20

BORING LOCATION S.W. CORNER OF WEST PROPERTY	DATE STARTED 6-13-86	DATE FINISHED 6-13-86
DRILLER Boyle Drilling Inc.	COMPLETION DEPTH (FT) 65'	NUMBER OF SAMPLES
DRILLING EQUIPMENT M-Drill B-61	ELEVATION AND DATUM	WATER DEPTH (FT) ≃ 53' (12" water)
DIAMETER AND TYPE OF WELL CASING 6" Pilot hole, 17" Reamed (well)	LOGGED BY Rod Law	Lithology interpretation from drilling & logs only

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
45	SP	SAND (W) OLIVE (5Y 4/4). FINE TO V. FINE CLEAN SAND. MOIST 3/3%					Clean sand.
50		SAND AS ABOVE.					Clean sand
55		SAND (W) OLIVE (5) 4/4). FINE TO V FINE CLEAN SAND. MOIST 15%					Clean Sand.
60	SP	SAND (W) OLIVE (5) 4/4). FINE TO V. FINE CLEAN SAND. WATER SATURATED					SAND - WATER SATURATED.
65		SAND AS ABOVE.					SAND WATER SATURATED.
TD							

FIGURE A-7 CONT.

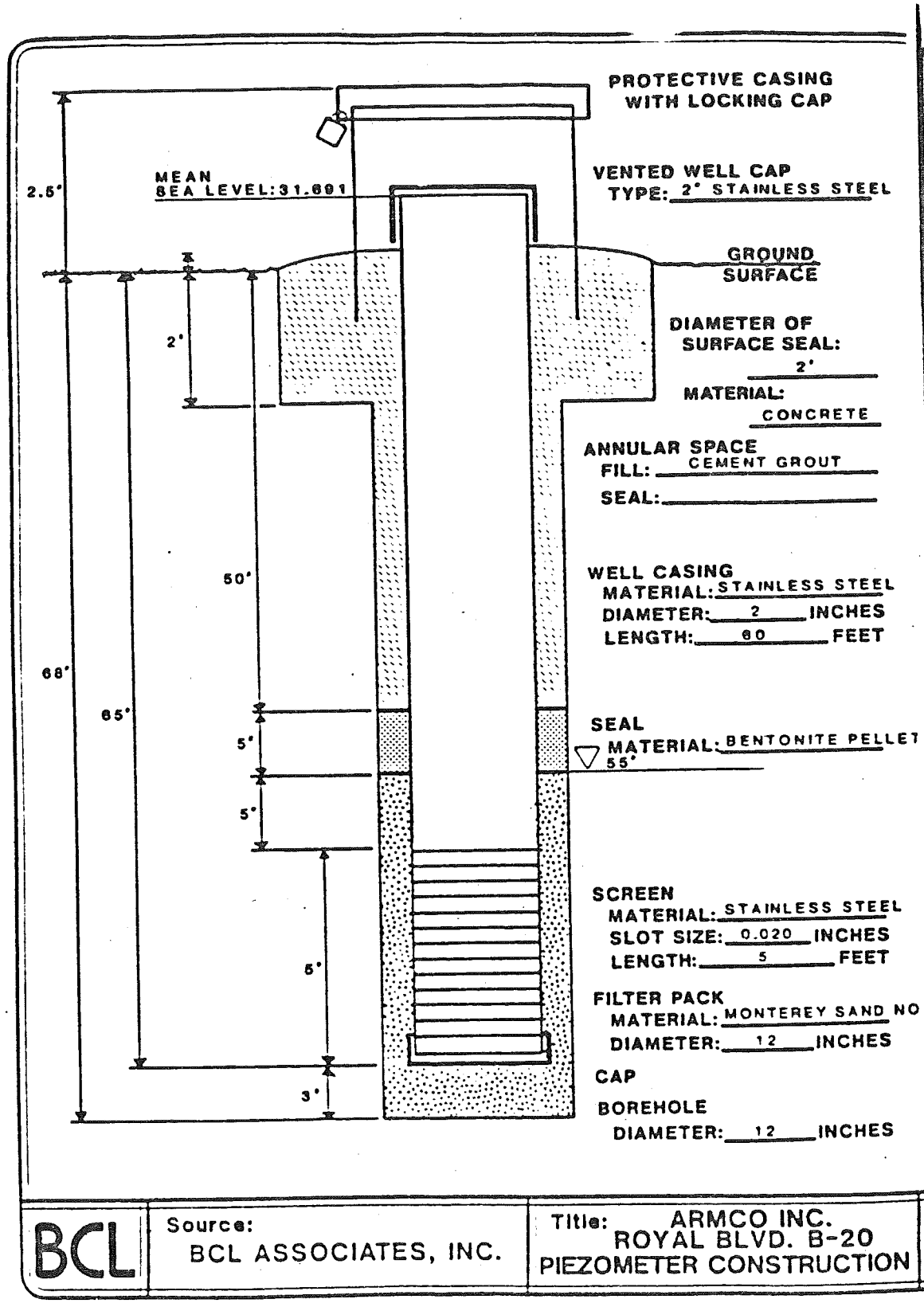

PROTECTIVE CASING
WITH LOCKING CAP
VENTED WELL CAP
TYPE: 2" STAINLESS STEEL
MEAN
SEA LEVEL: 31.601
2.5'
GROUND
SURFACE
2'
DIAMETER OF
SURFACE SEAL:
2'
MATERIAL:
CONCRETE
ANNULAR SPACE
FILL: CEMENT GROUT
SEAL:
50'
WELL CASING
MATERIAL: STAINLESS STEEL
DIAMETER: 2 INCHES
LENGTH: 60 FEET
68'
65'
5'
SEAL
MATERIAL: BENTONITE PELLET
55'
5'
5'
SCREEN
MATERIAL: STAINLESS STEEL
SLOT SIZE: 0.020 INCHES
LENGTH: 5 FEET
FILTER PACK
MATERIAL: MONTEREY SAND NO
DIAMETER: 12 INCHES
3'
CAP
BOREHOLE
DIAMETER: 12 INCHES
BCL
Source:
BCL ASSOCIATES, INC.
Title: ARMCO INC.
ROYAL BLVD. B-20
PIEZOMETER CONSTRUCTION

FIGURE A-8

...CL ASSOCIATES, INC. BORING LOG AND SAMPLING RECORD

PAGE 1 OF Two

PROJECT NAME Royal

PROJECT NUMBER 85-277 BORING DESIGNATION B-23

BORING LOCATION SE CORNER OF EAST PROPERTY	DATE STARTED 6-13-86	DATE FINISHED 6-13-86
DRILLER Bayline.	COMPLETION DEPTH (FT) 65'	NUMBER OF SAMPLES —
DRILLING EQUIPMENT M. DRILL B-61. H.S.A.	ELEVATION AND DATUM	WATER DEPTH (FT) 35'
DIAMETER AND TYPE OF WELL CASING 6" PILOT HOLE 12" WELL REAMED	LOGGED BY Rod Lazo.	

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
5	SM	SAND(W) OLIVE YELLOW (2.5Y 6/6) SILTY FINE SAND. DRY.					CLEAN SAND.
10		SAND, AS ABOVE MOISTURE >12%					CLEAN SAND.
15		SAND, AS ABOVE.					CLEAN SAND.
20	SM	SAND (W) LIGHT OLIVE BROWN SILTY. SAND. MOISTURE >12%					CLEAN SAND
25		SAND AS ABOVE					CLEAN SAND
30	SM	SAND (W) OLIVE (5Y 5/3) SILTY FINE SAND, WOOD. MOIST >12%					CLEAN SAND.
35		SAND AS ABOVE.					CLEAN SAND
40		SAND AS ABOVE.					CLEAN SAND.
45							

FIGURE A-9

BCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PAGE 2 C

PROJECT NAME Royal

PROJECT NUMBER 85-273

BORING DESIGNATION B-23

BORING LOCATION S.E. Corner of East Property.	DATE STARTED 6-13-86	DATE FINISHED 6-13-
DRILLER Beylik.	COMPLETION DEPTH (FT) 65	NUMBER OF SAMPLES —
DRILLING EQUIPMENT M. Drill B-61. U.S.A.	ELEVATION AND DATUM	WATER DEPTH (FT) ≃ 5.
DIAMETER AND TYPE OF WELL CASING 6" pilot hole. 12" well (reamed)	LOGGED BY Ros. Lazo	Lithology referred from drilling cutt

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
45	SP	Sand, olive (5Y 5/4) Moisture ≃ 15%.					clean sand
50		Sand as above					clean sa
55		Sand as above. but moist up to 20%.					clean sa
60	SP	Sand as above. water saturated.					clean sa
65 TD		Sand as above.					clean sa

FIGURE A-9 CONT

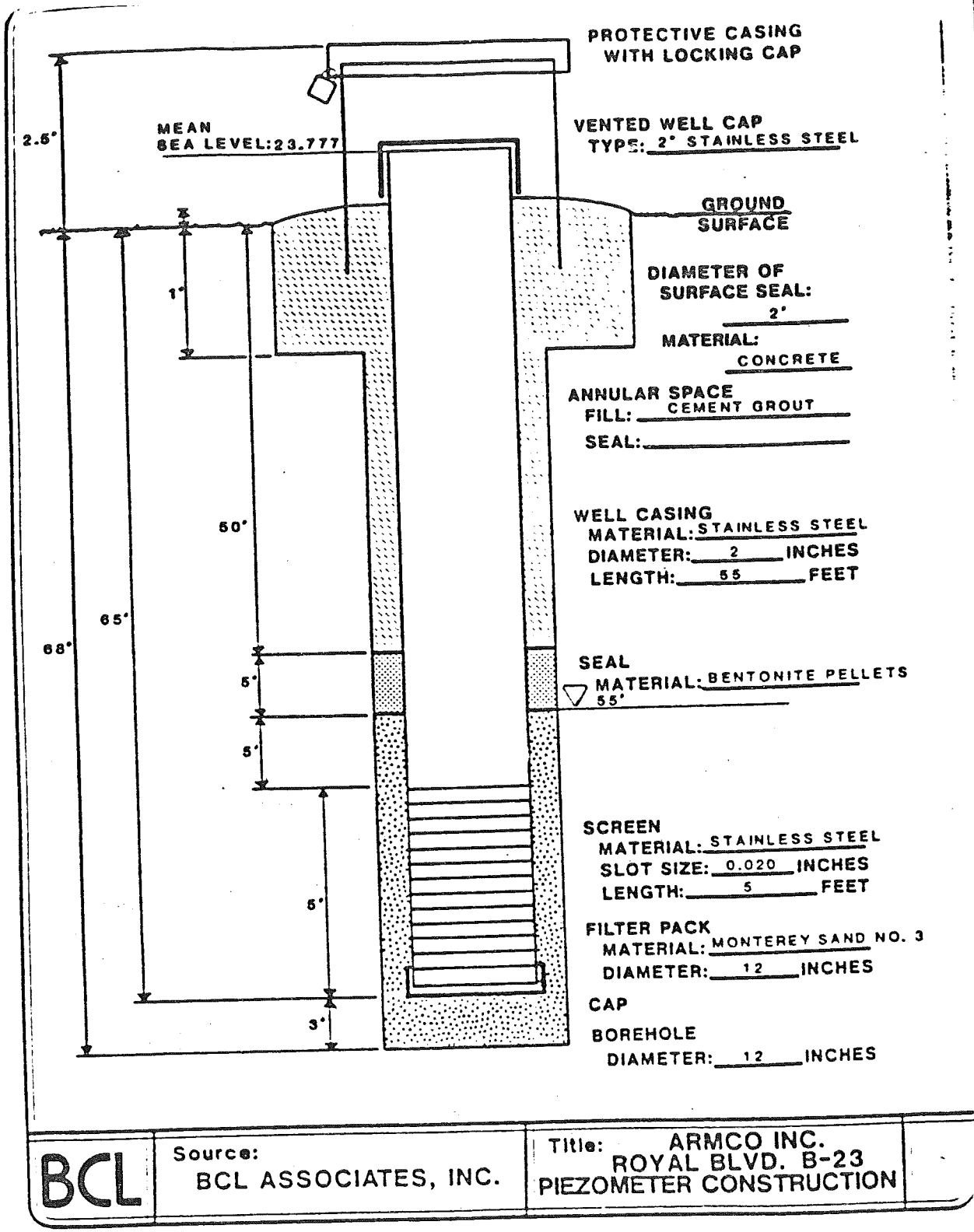


FIGURE A-10

SCL ASSOCIATES, INC.

BORING LOG AND SAMPLING RECORD

PAGE 1 OF TWO

PROJECT NAME Royal

PROJECT NUMBER 85-273

BORING DESIGNATION B-26

BORING LOCATION NE. CORNER OF EAST PROPERTY.	DATE STARTED 6-16-86	DATE FINISHED 6-16-86
DRILLER Beylik	COMPLETION DEPTH (FT) 65	NUMBER OF SAMPLES —
DRILLING EQUIPMENT H. Drill B-61. H.S.A.	ELEVATION AND DATUM	WATER DEPTH (FT) ?
DIAMETER AND TYPE OF WELL CASING 6" Auger. Pilot hole 12" hole reamed	LOGGED BY Rodero	Lithologs prepared from drilling cuttings only

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
	FILL	Sand. Formerly sand on surface w/ slag. metal - wood. Concrete					Slag.
5		Sandy Black soil. (2.5) N2) clayey. Moisture ≈ 12%.					Black clayey soil.
10	Soil	Sandy Black Soil as above					Black clayey Soil
15	SM	Sand (w) Olive Brown (2.5Y 4/4) Silty clayey sand.					Sand (clean)
20		Sand (w) Light olive brown (2.5) 5/6) Silty clayey Sand. Moisture = 12%					Sand (clean)
25		Sand. As above					Sand (clean)
30		Sand. as above					Sand (clean)
35	SM	Sand (w) Olive yellow (5Y 6/4) Silty fine sand. Moisture = 12%					Sand (clean)
40		Sand, As above					Sand (clean)

FIGURE A-11

BCL ASSOCIATES, INC. **BORING LOG AND SAMPLING RECORD**

PROJECT NAME: Royal

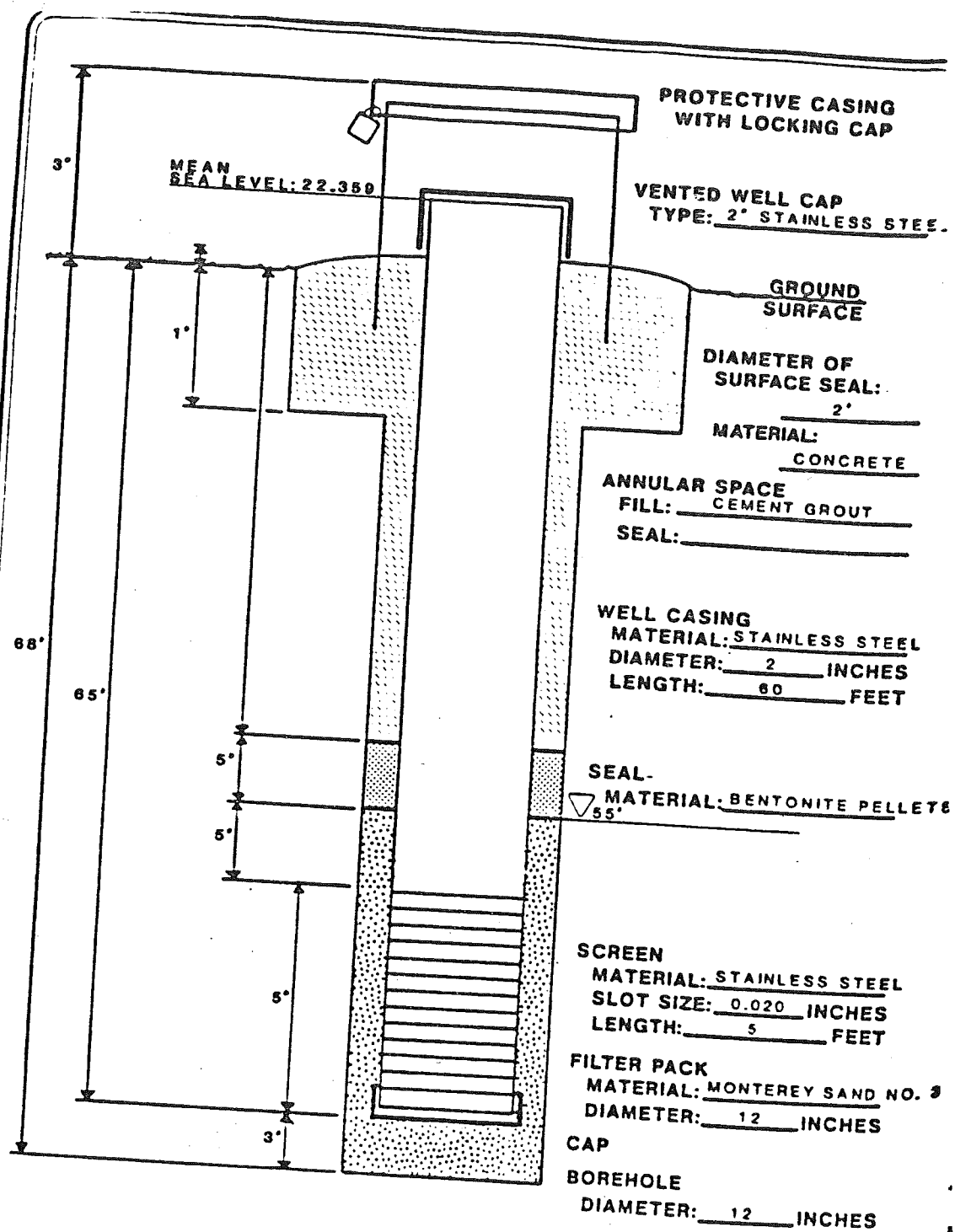
PROJECT NUMBER: 85-273

BORING DESIGNATION: B-26

BORING LOCATION: NE corner of East property.		DATE STARTED: 6-16-8_	DATE FINISHED: 6-16-8_
DRILLER: Beylik.		COMPLETION DEPTH (FT): 65	NUMBER OF SAMPLES: —
DRILLING EQUIPMENT: M. Drill B-61. H.S.A.		ELEVATION AND DATUM:	WATER DEPTH (FT): ?
DIAMETER AND TYPE OF WELL CASING: 6" Auger (pilot hole) 12" auger (well reamed).		LOGGED BY: Rodiaz	Litho-logs were from drilling cuttings a

DEPTH (FEET)	LITHOLOGY	DESCRIPTION	SAMPLE NO.	DATE	TIME		REMARKS
45	SM	Sand, (w) olive yellow (5Y 6/8) silty fine sand moisture = 12%					Sand (clean)
50		Sand, as above					Sand (clean
55	SM/SP	Sand, (w) olive (5Y 5/4) fine sand. Moisture = 15%					Sand (clean.
60		Sand = as above.					Sand (clean
65		Sand, as above					Sand (clean).

FIGURE A-1 CONT



BCL

Source: BCL ASSOCIATES, INC.

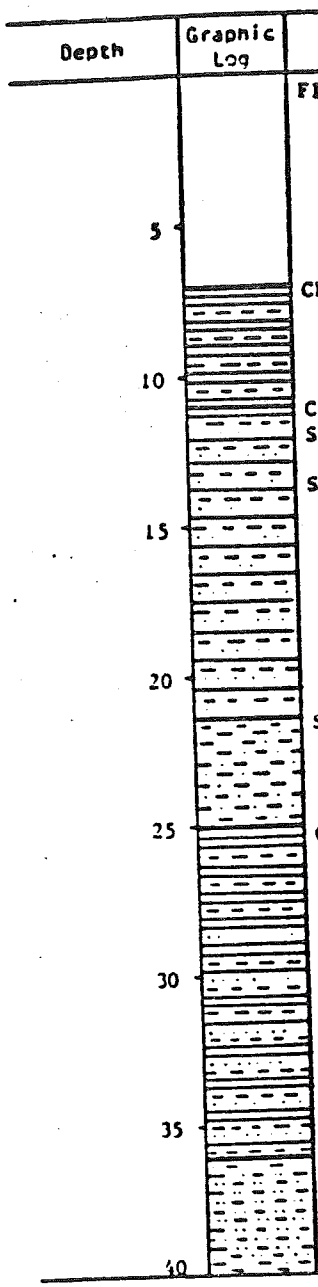
Title: ARMCO INC. ROYAL BLVD. B-26 PIEZOMETER CONSTRUCTION

FIGURE A-12

E-05200-D

LITHLOGIC LOG

Well No. 1



Description of Materials	
FILL	Clay, silty, dark brown and grey, some sand few gravel, mottled, slightly damp, sticky
CLAY	Clay, silty, dark grey-brown, slightly sandy, moderately firm, slightly damp, sticky
CLAY SILT & SAND	Clay, silt and sand mixtures, gradational, interbeds, grey-yellow brown, blue grey
SILT	Silt, sandy, grey-blue grey, very fine sand, medium amounts of clay
CLAY	Clay, silty, brown, gradational clay, silt and sand layers, sticky
	Grading sandier
SAND	Sand, silty, light brown-yellow brown, abundant thin shell fragments

FIGURE A-13

LITHOLOGIC LOG

Well No. 8

Depth	Graphic Log		Description of Materials
		CLAY	Clay, silty, brown, abundant fine sand, some silt, slightly sticky
45		SILT	Silt, organic, blue-green, mottled yellow and rust brown, some very fine sand, traces of organics
50			
55		SAND	Sand, silty, very fine sand with moderate amounts of silt, brown-mottled blue grey and yellow brown, thin silt and clay interbeds
60		SILT	Silt, brown, with Clay and fine sand, traces of organics
65		SILT	Silt, clayey, blue grey - mottled rust brown, with large amounts of very fine sand, slightly fat
70			Silt interbeds, rust brown, plastic, sticky, also silty sand interbeds, blue grey
75		CLAY	Clay, silty, brown, moderate amounts of very fine sand
80			Silt interbeds, clayey, brown and thin interbeds of sand, grey, medium grained

FIGURE A-13 CONT.

LITHOLOGIC LOG

Well no. 1

Depth	Graphic Log		Description of Materials
		SAND	Sand, poorly graded, medium grained, traces of wood, faintly lenticular, firm
85			
90			Clayey, few silt interbeds (30% clay and silt)
95		SAND	Sand with silt and clay interbeds, brown, light grey brown, moderate amounts of clay in sand, grey clayey silt interbeds, very fine - fine sand, sticky
100			
105			
110			
115		SILT	Silt, sandy and clayey, light grey brown, very fine - fine sand, some clay interbeds, very sticky Clayey, thinly laminated, damp
120			

FIGURE A-13 CONT.

LITHOLOGIC LOG

Well No. 8

Depth	Graphic Log		Description of Materials
			Blue grey and brown silt, medium amount of very fine sand, faint laminations, micaceous, local 4-6" brown silty clay layer, damp
			Thin blue silt layer
125		CLAY	Clay, silty, blue-grey to brown, large amounts of silt, few pods of very fine sand, very firm, damp
			Brown to light brown
130			
			Sandy silt layers
135			
			Grey-green, abundant shells, large amounts very fine sand
		SAND	Sand, grey-green, very fine grained, moderate amounts of micaceous silt, damp
140			
			20% silt and clay layers, blue-grey with shells
145			
150			
155			Brown clay layers, brown sandy silt layers, 30-40% silt and clay
160			

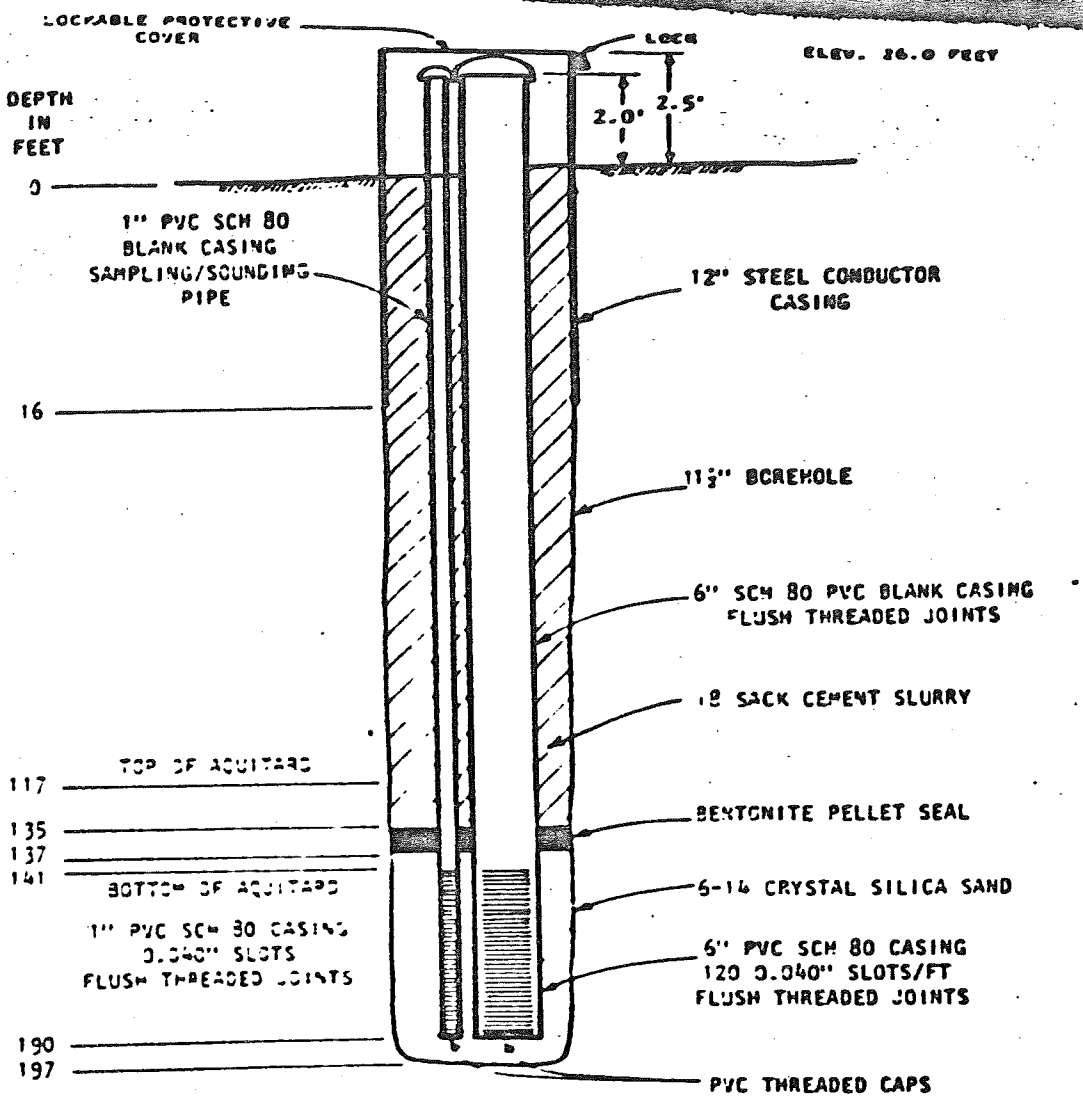
FIGURE A-13 CONT.

LITHOLOGIC LOG

Well No. 8

Depth	Graphic Log	Description of Materials
		40-45% silt and clay beds
165		
170		
175		Less clay, silty, very fine sand, shells, few brown clay beds
180		Increase in clay content, 30-35%, fewer shells
185		Some brown sandy silt and clayey silt interbeds, primarily blue-grey, very fine to fine grained sand, wood fragments, local shell beds
190		
195		Dark grey brown silty sand, very fine grained, large amounts of silt
200		Total depth at 198.5 feet

FIGURE A-13 CONT



NOTE: Centralizers at 20, 80, 140, and 190 foot depths.

MONITORING WELL MW-12D
CONSTRUCTION DETAILS

NOT TO SCALE

LeROY CRANDALL AND ASSOCIATES

PLATE 4

FIGURE A-14

LITHOLOGIC LOG

Well No. 2

Depth	Graphic Log		Description of Materials
		CLAY	Clay, dark grey-brown, firm, slightly damp
5		CLAY	Clay, silty, blue-grey, slight amounts of fine sand, organic odor, sticky
10		CLAY	Clay, silty, sandy, dark brown, moderate amounts sand in brown-yellow brown silt beds, slightly damp
15		SILT	Silt, sandy, clayey, blue grey, laminated, slight to moderate amounts of fine sand, organic odor, sticky
			6" thick, blue-grey silty clay, stiff, strong organic odor
20			Local increase in sand content
			Brown clay interbeds
25		SILT	Silt, clayey, brown, micaceous, clay interbeds, moderate amounts of very fine sand
30			
35			
40			Local grey clay beds

FIGURE A-15

LITHLOGIC LOG

Well No. 2

Depth	Graphic Log		Description of Materials
45		CLAY	Clay, silty, light brown, stiff
		SILT	Silt, sandy, yellow-rust brown, moderate-large amounts very fine sand, silt interbeds
50		SAND	Sand, silty, brown-yellow brown, fine sand, moderate amount of silt
55		SILT	Silt, clayey, brown-yellow brown, moderate amounts of very fine sand
60		SAND	Sand, very fine grained
		SILT	Silt, clayey, brown and grey, some very fine sand Moderate-large amounts of very fine sand, micaceous, organic odor
65		SAND	Sand, silty, 6" layer
		SILT	Silt, clayey, sandy, brown-yellow brown, abundant small shell fragments
70		CLAY	Clay, silty, brown and rust brown, some very fine sand
		SILT	Silt, clayey, blue-grey, traces of organics
75		CLAY	Clay, silty, grey and brown, moderately stiff
		SAND	Sand, brown, very fine to fine grained
80			

FIGURE A-15 CONT

LITHOLOGIC LOG

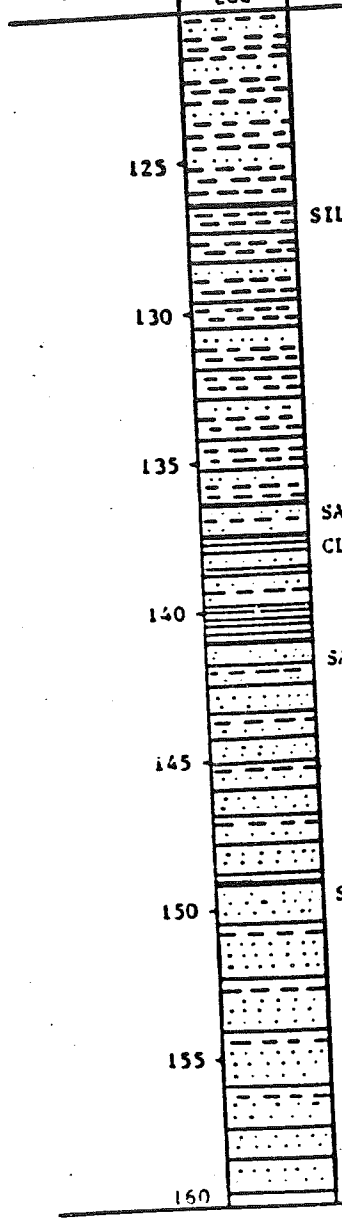
Well No. 2

Depth	Graphic Log		Description of Materials
85			Local silt beds
90			
95			Coarse grained sand, pebbly
		SILT	Silt, brown, micaceous, slightly damp
		SAND	Sand, clayey, very fine grained
100		SILT	Silt, grey with moderate amounts very fine sand
		SAND	Sand, silty, grey-green, very fine-fine grained, moderate amounts silt, some clay
105		SILT	Silt, sandy, grey green, large amounts of very fine grained sand
110			Sporadic shell layers
115			
		SILT	Silt, clayey, grey-green, few shells, less sand
120			

FIGURE A-15 CONT

LITHOLOGIC LOG

Well No. 2



Description of Materials

Silt, clayey, grey and brown, rust colored streaks, some very fine sand, firm, slightly sticky

Sand, silty, grey-green, yellow-brown streaks

Clay, sandy, grey and brown, firm, sticky thin silty clay interbeds

Shell bed, rust brown, silty sand

Sandy, grey and brown

Sand, clayey, blue grey to olive grey, dull yellow streaks, moderate amounts of clay and silt beds, micaceous

Sand, some clay and silt, blue grey

Shell bed in blue-grey silty sand

Grading to clayey sand

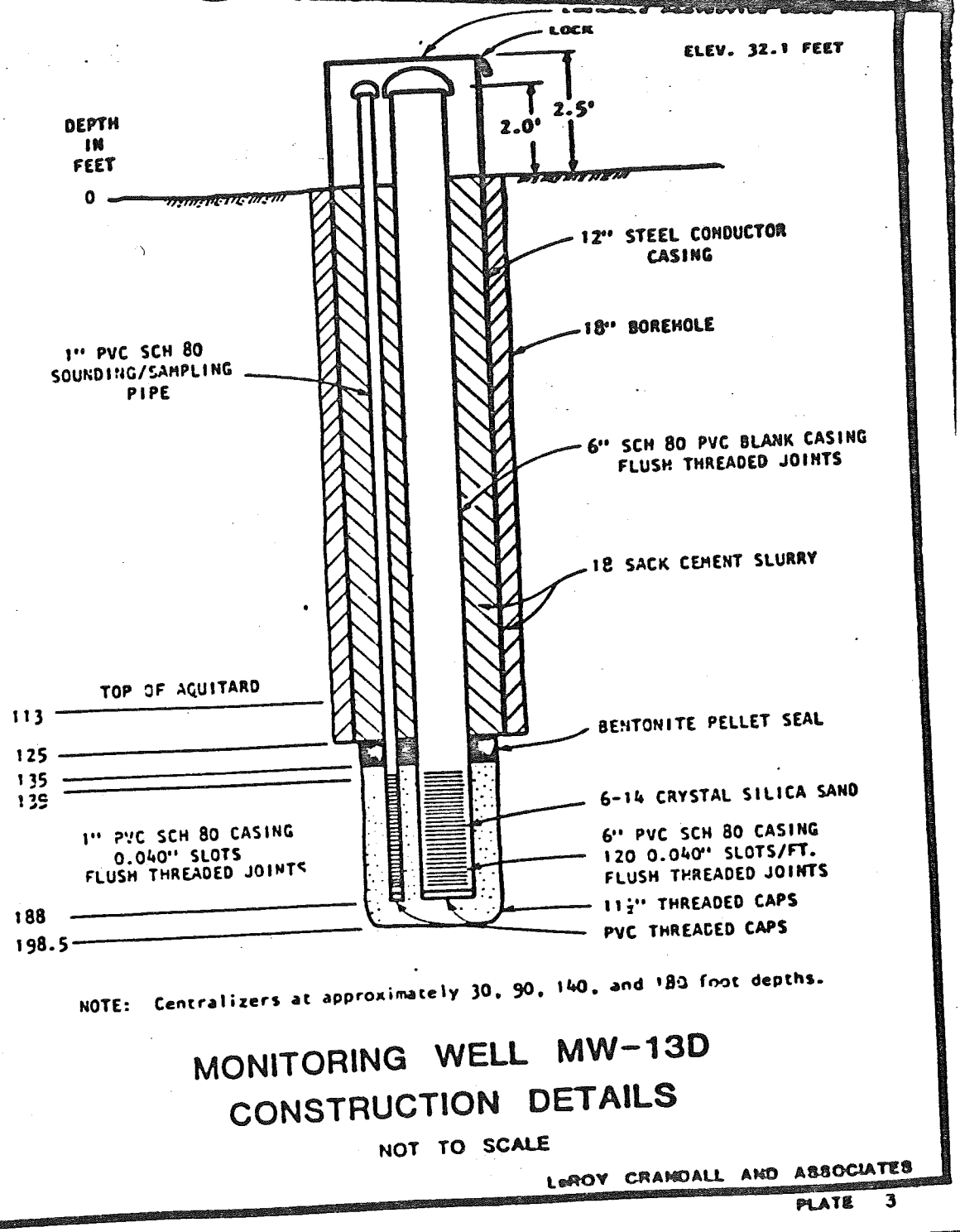
FIGURE A-15 CONT

LITHLOGIC LOG

Well No. 2

Depth	Graphic Log		Description of Materials
		SILT	Silt, clayey, olive brown, rusty streaks, some very fine sand
		SAND	Sand, silty
165		SILT	Silt, clayey, blue-grey rust yellow-brown, mottled, some very fine sand, few shells, organics
170			
		SILT	Silt, sandy, blue-grey, yellow-brown mottling, moderate to large amounts of very fine sand
175		SAND	Sand, clayey and silty, grey-brown, very fine sand, moderate to large amounts of silt with clay
180			
185			Mixtures vary, primarily very fine sand
190			
195			Total depth at 197 feet
200			

FIGURE A-15 CONT.



NOTE: Centralizers at approximately 30, 90, 140, and 180 foot depths.

MONITORING WELL MW-13D
CONSTRUCTION DETAILS

NOT TO SCALE

LeROY CRANDALL AND ASSOCIATES

PLATE 3

FIGURE A-16

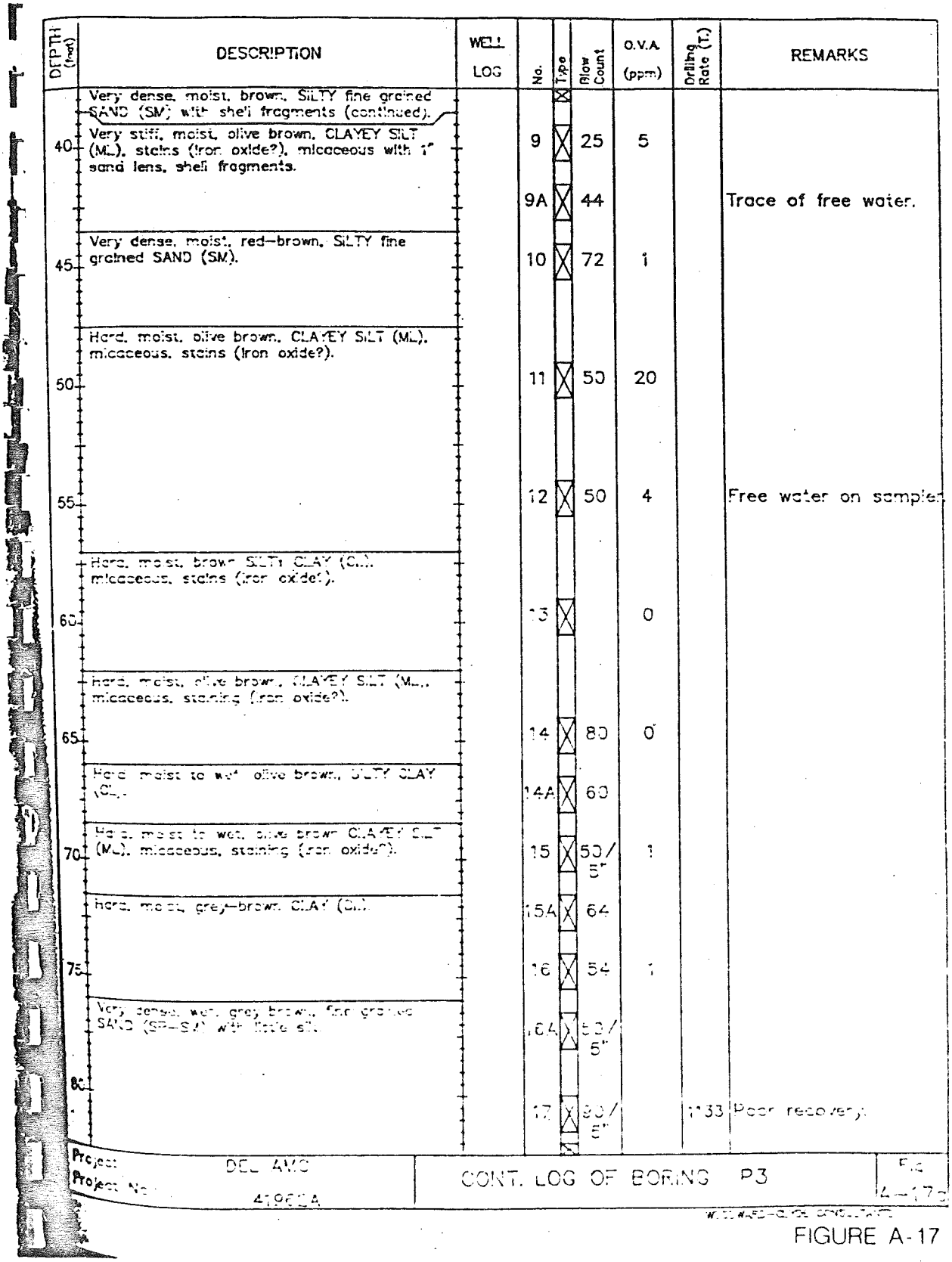


FIGURE A-17

Depth (feet)	DESCRIPTION	WELL LOG	No.	Type	Blow Count	O.V.A. (ppm)	Drilling Rate (T.)	REMARKS
	Very dense, moist to wet, grey-brown, fine grained SAND (SP-SM) with little silt, stains (iron oxide?).		17A	⊠	50/ 10"	0		
85			18	⊠	100/ 4"	0		
			18A	⊠	100/ 4"			
90			19	⊠	100/ 6"	0	1510	
			19A	⊠	100/ 5"		1555	
			20	⊠	100/ 4"			
95	Bottom of Boring at 94.9 feet.							
100	Notes: 1. Boring was drilled with a Mobile drill B-61, using 8-inch outside diameter hollow Stem Auger to a depth of 77 feet and then was enlarged using a 9 7/8-inch drill bit and mud rotary technique to a depth of 94.9 feet.							
105								
110								
115								
120								
125								

Project: DEL AMO
Project No. 41BOLA

CONT. LOG OF BORING P3

Fig. 4-17c

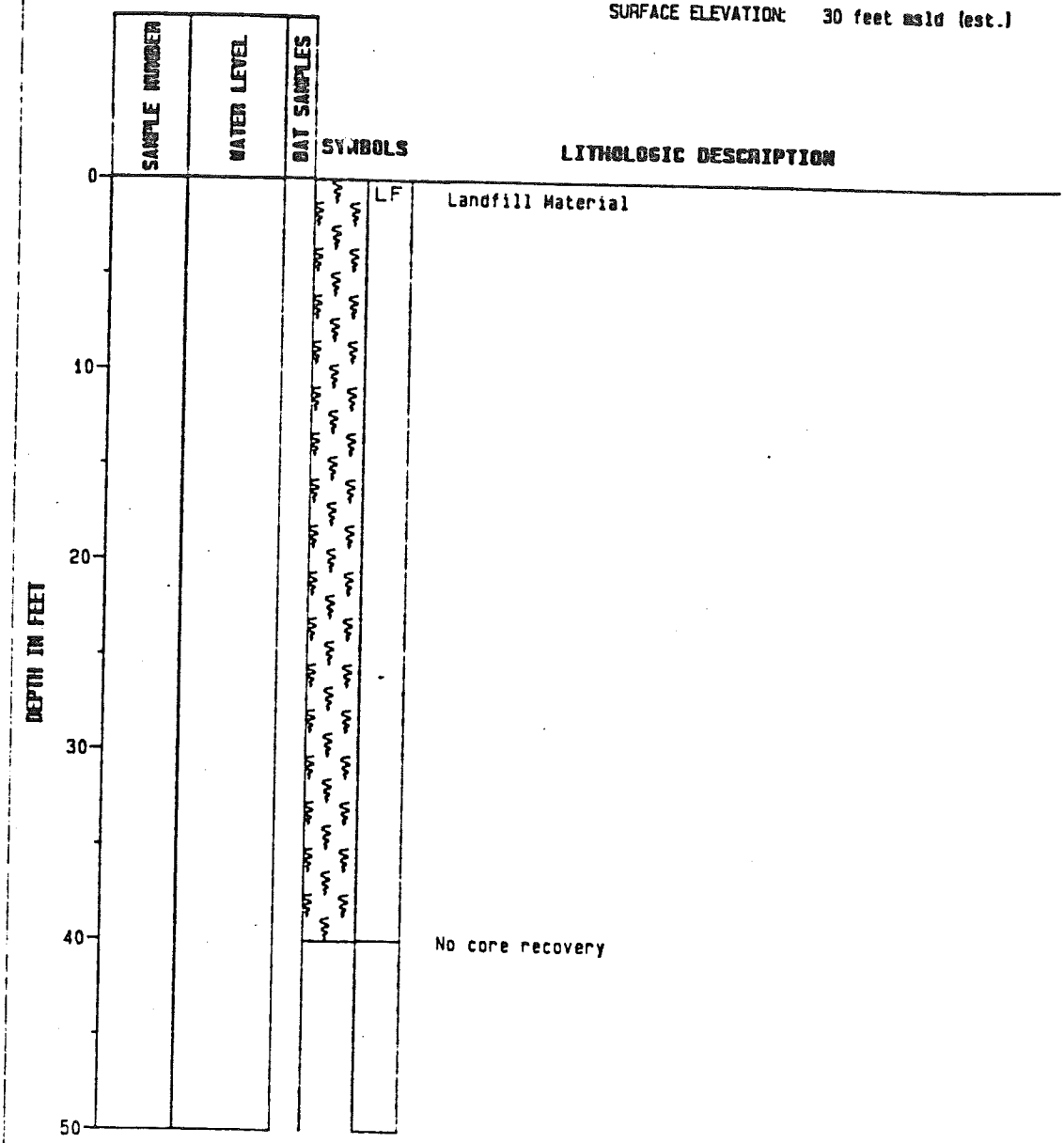
WOODWARD-CLYDE CONSULTANTS

FIGURE A-17 CONT.

BORING DA-1A

DATE DRILLED: 9/6-29/88

SURFACE ELEVATION: 30 feet msld (est.)



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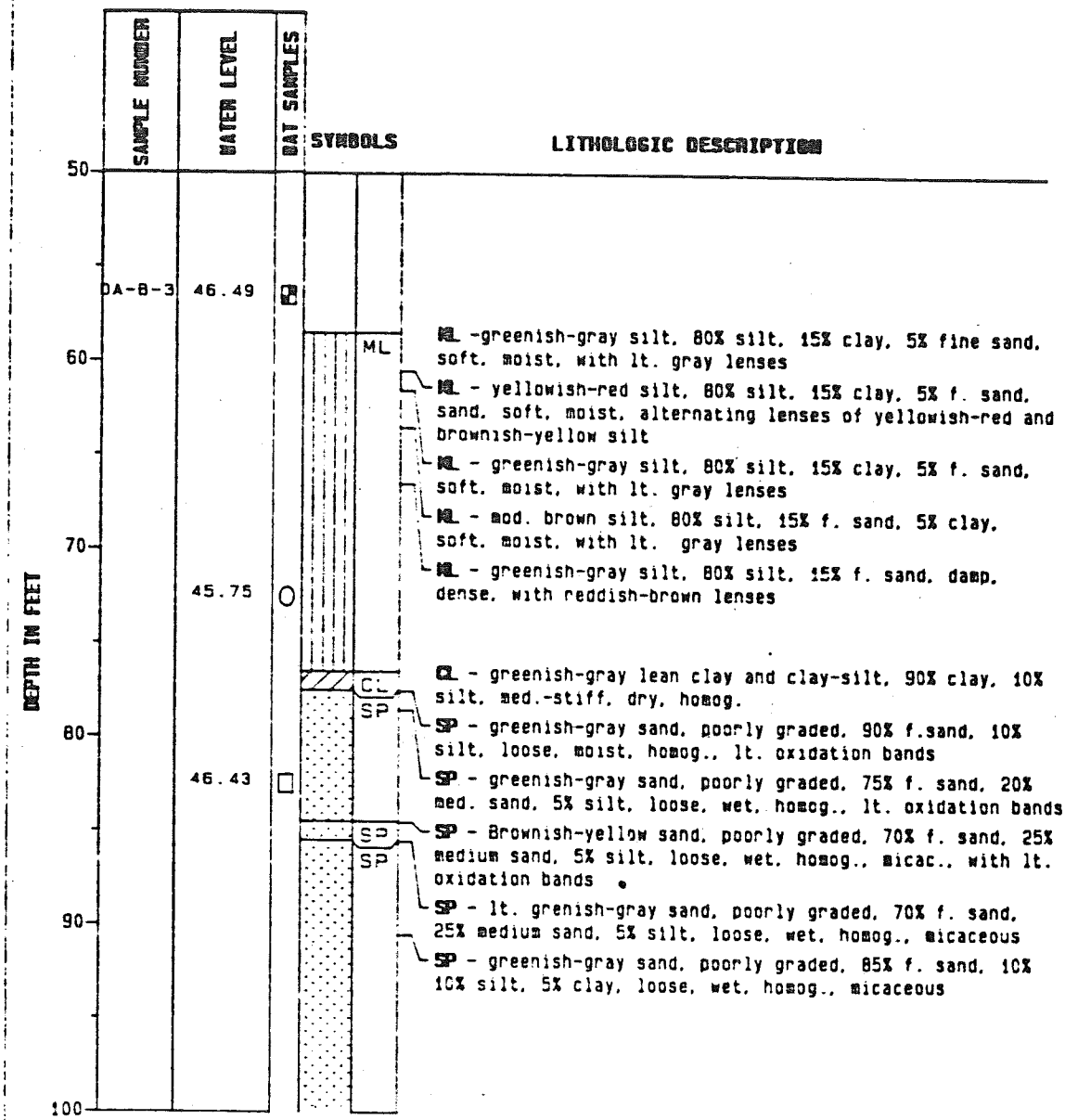
DEL AMO ESI
TORRANCE, CA

FIGURE A-18

BORING DA-1A

Continued...



ecology and environment, inc.

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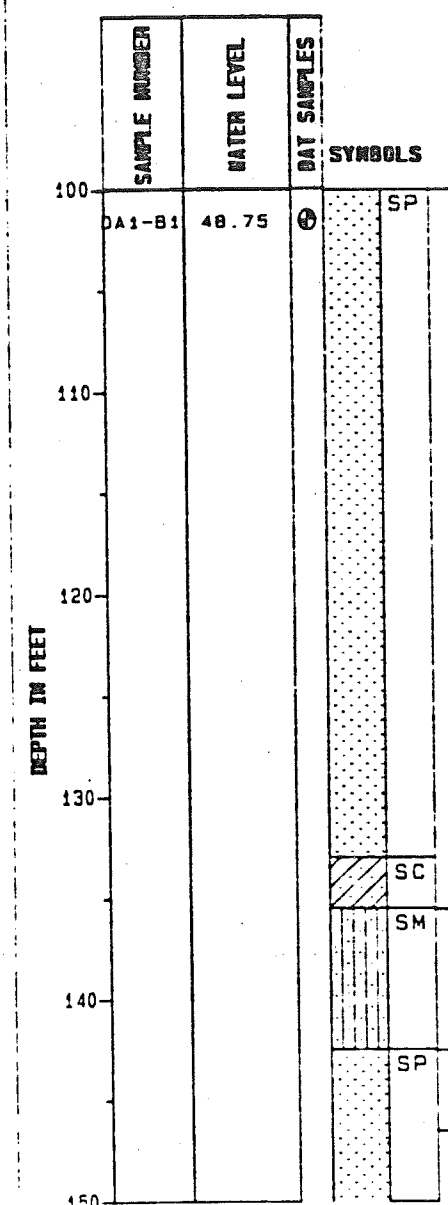
TORRANCE, CA

FIGURE A-18 CONT

BORING DA-1A

Continued...



SP - greenish-gray sand, poorly graded, 75% f. sand, 15% med. sand, 5% silt, 5% clay, loose, wet, homog., micaceous, >1mm shell frags., mildly reactive

SC - greenish-gray clayey sand with gravel, 60% f. sand, 25% clay, 10% med. sand, 5% gravel, loose, moist, micac., stratified shell frags. (>1mm), strong HCl reaction

SM - greenish-gray silty sand with clay, 50% silt, 25% f. sand, 25% clay, loose, moist, stratified, micac., some oxida.

SM - greenish-gray silty sand, 60% f. sand, 30% silt, 10% clay, loose, wet, homog., shell frags. (1mm-1cm), HCl reac.

SP - greenish-gray sand, poorly graded, 60% f. sand, 20% silt, 10% med. sand, 10% clay, loose, wet, homogeneous

SP - greenish-gray sand, poorly graded, 60% med. sand, 30% f. sand, 10% silt and clay, loose, moist, homogenous

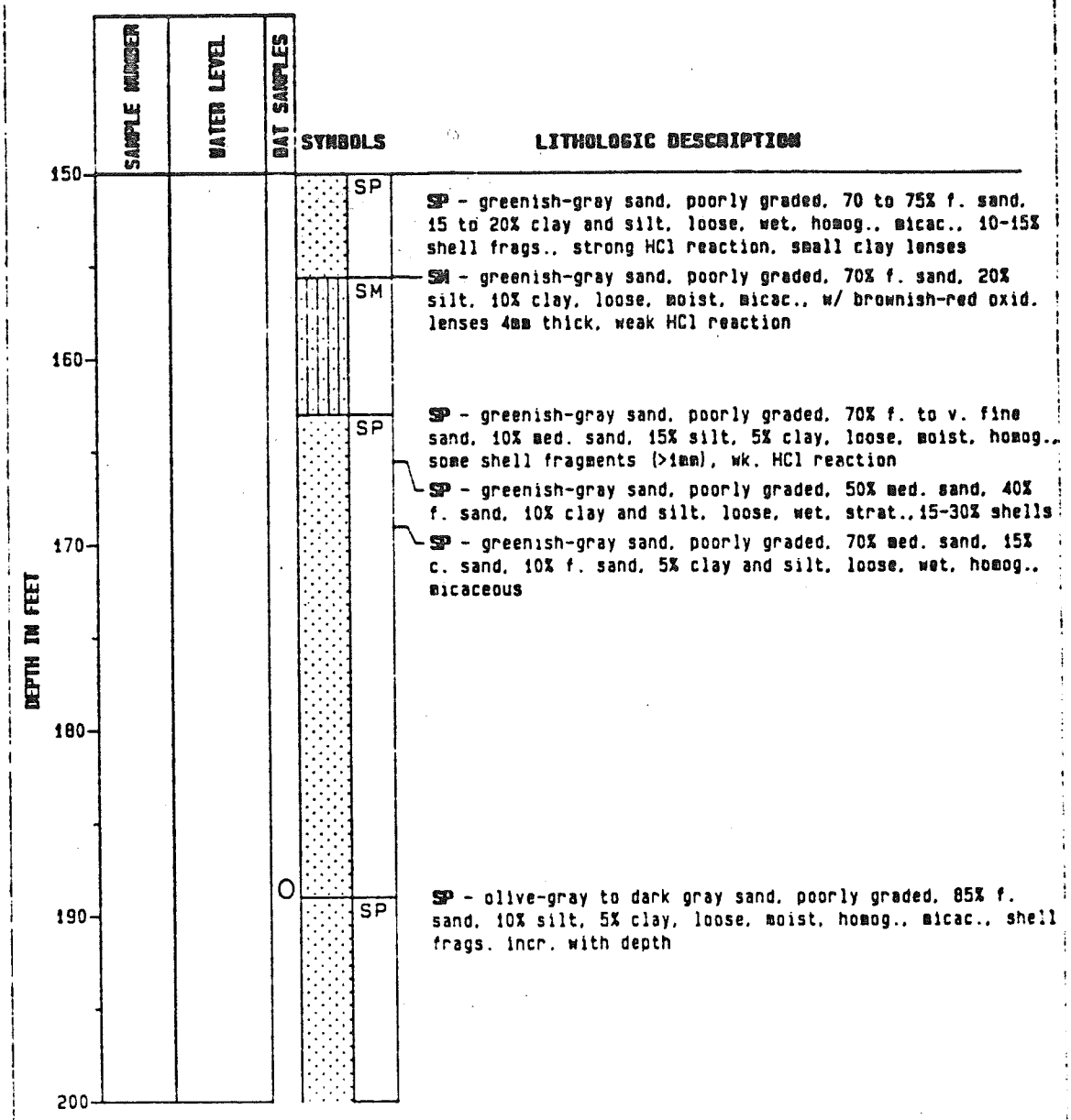
ecology and environment, inc.

DEL AMO ESI
TORRANCE, CA

FIGURE A-18 CONT.

BORING DA-1A

Continued...



ecology and environment, inc.

DEL AMO ESI
TORRANCE, CA

FIGURE A-18 CONT

BORING DA-1A

Continued...

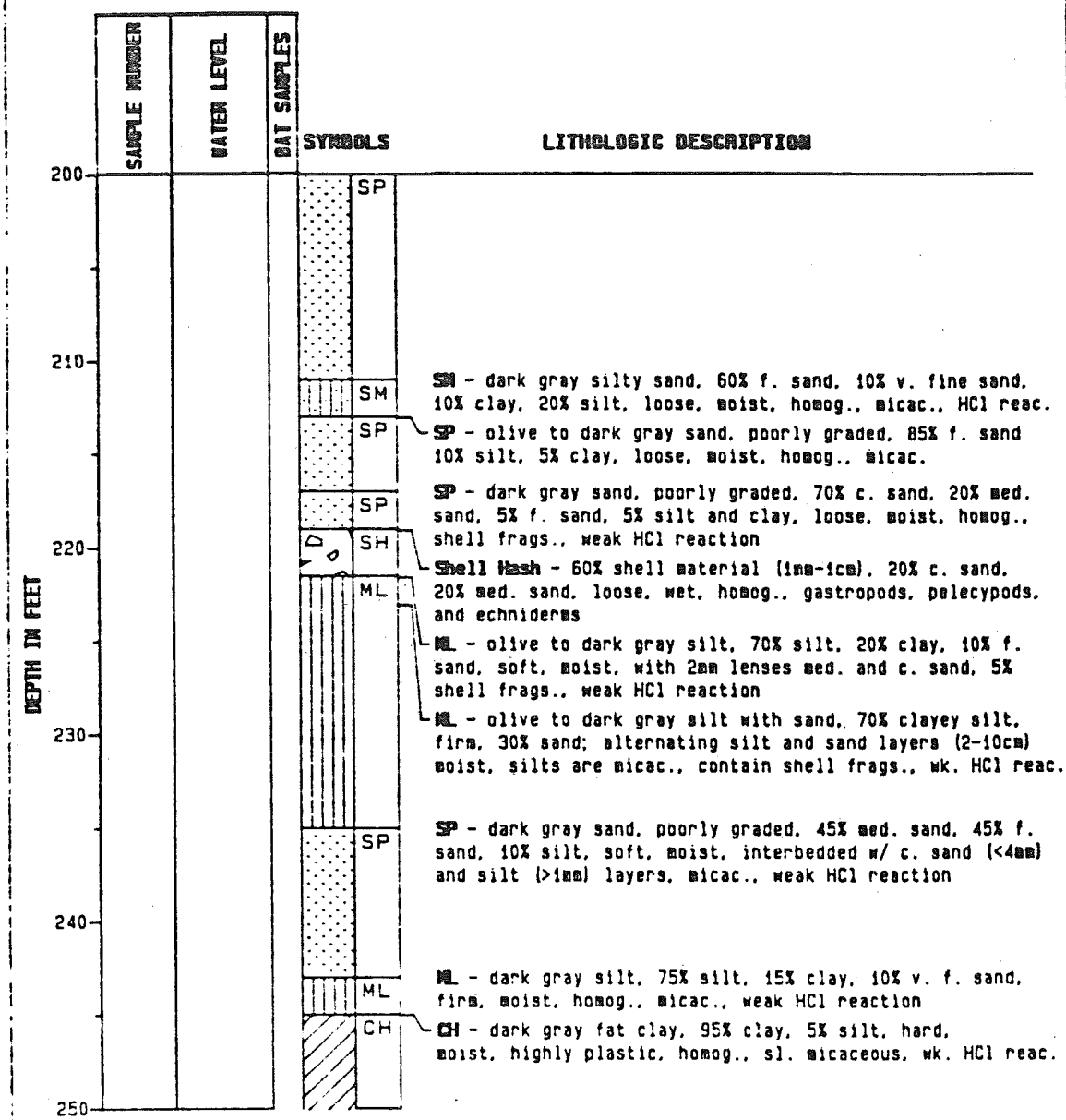


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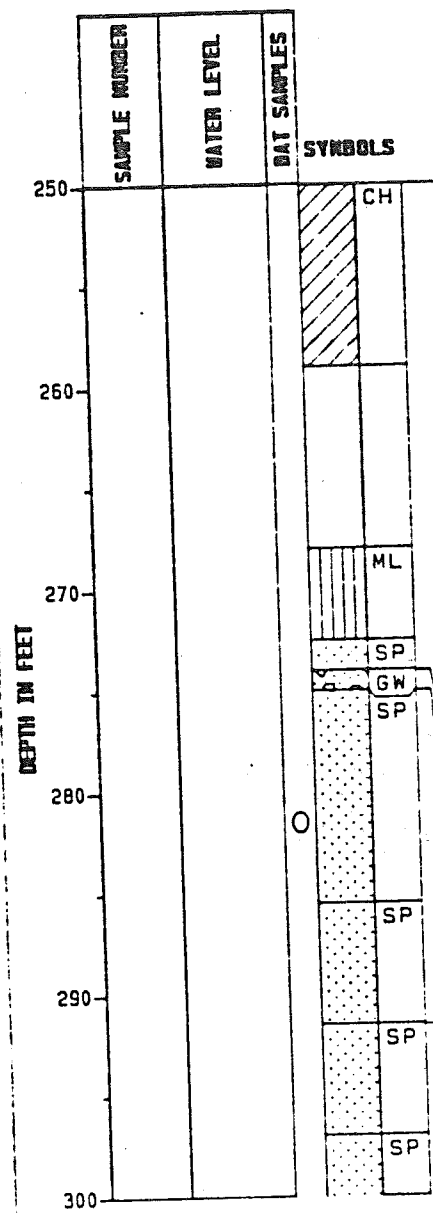
FIGURE A-18 CONT

BORING DA-1A

Continued...



No core recovery

ML - dk. gray silt, 60% silt, 40% clay, firm, moist, homog

SP - olive gray sand, poorly graded, 75% c. sand, 10% med. sand, 10% f. sand, 5% silt and clay, soft, wet, homog., some gravel (2mm-5mm), calcareous clay concretions, wk. HCl react

GW - olive-gray gravel, well graded, 60% gravel (1-2cm), 20% c. sand, 10% f. sand, 5% med. sand, 5% silt and clay, loose, wet, shell frag. (1-5mm), st. HCl reaction

SP - greenish-gray sand, poorly graded, 60% c. sand, 15% v. coarse sand, 10% med. sand, 10% f. sand, 5% silt and clay, some gravel, loose, wet, homog., wk. HCl reaction

SP - greenish-gray sand, poorly graded, 70% med. sand, 20% f. sand, 5% c. sand, 5% clay and silt, soft, moist, homog., micaceous and pyritic

SP - greenish-gray sand, 60% c. sand, 20% v. c. sand, 10% med. sand, 5% f. sand, 5% clay and silt, soft, moist, homog.

SP - olive gray sand, poorly graded, 80% med. sand, 15% f. sand, 5% silt and clay, moist, weak HCl reaction

SP - greenish-gray sand, poorly graded, 80% f. sand, 15% med. sand, 5% clay and silt, moist, homog., micac., wk. HCl

DEL AMO ESI
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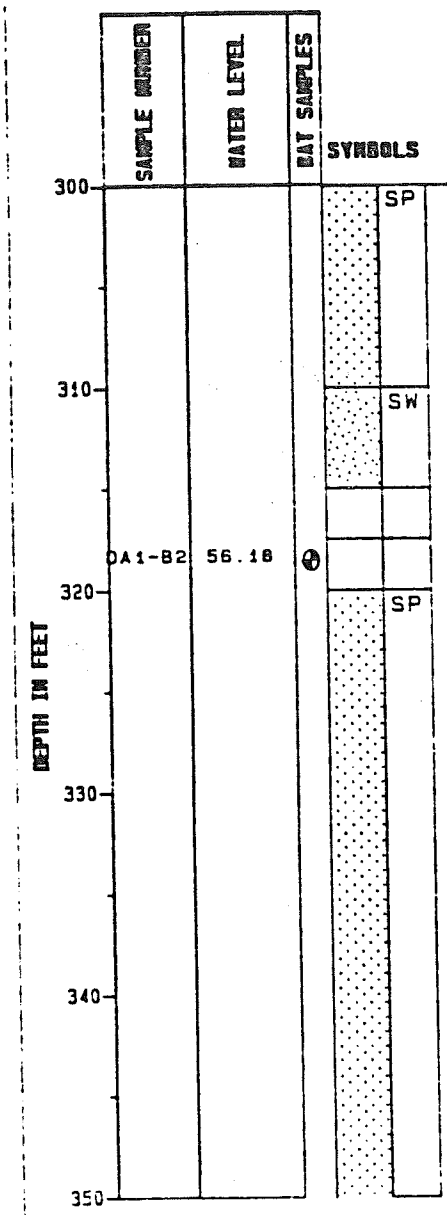
FIGURE A-18 CONT.

BORING DA-1A

Continued...



SW - greenish-gray sand, poorly graded, 20% v. c. sand, 30% c. sand, 30% med. sand, 10% f. sand, 5% silt and clay, 5% gravel (9mm), loose, moist, stratified

No core recovery

Alternating layers (1-3 ft) of fine and medium sand
SP - greenish-gray sand, 85% f. sand, 10% med. sand, 5% 5% clay and silt, loose, moist, homog.
SP - greenish-gray sand, 85% med. sand, 10% f. sand, 5% silt and clay, loose, moist, homog.

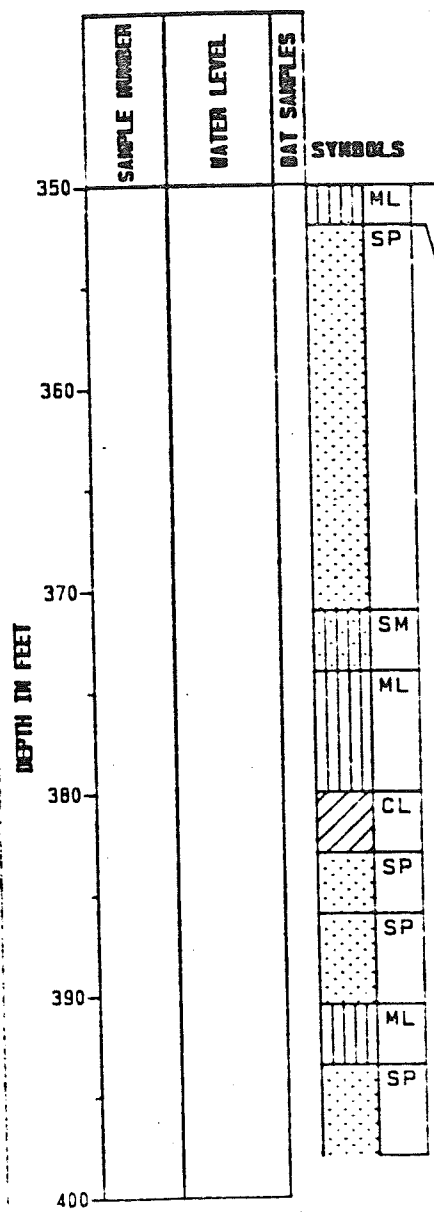
ecology and environment, inc.

DEL AMO ESI
TORRANCE, CA

FIGURE A-18 CONT.

BORING DA-1A

Continued...



ML - gray silt, 85% silt, 10% f. sand, 5% clay, hard, dry, laminated, micac., weak HCl reaction

Alternating layers (2-4 ft) of fine and medium sand

SP - gray sand, poorly graded, 85-90% f. sand, 10-15% silt and clay, loose, moist, homog., micac., shell frags.

SP - gray sand, poorly graded, 85% med. sand, 10% f. sand, 5% silt and clay, loose, moist, homog., micac, shell frags.

SM - olive gray silty sand, 65% f. sand, 30% silt, 5% clay moist, hard, interbedded sands and silts, micac., HCl reac.

ML - gray silt, 85% silt, 10% clay, 5% f. sand, hard, moist, interbedded sand, silts, and clays, micac., shell frags.

CL - gray clay, 85% clay, 15% silt, dry, hard, homog., wk. HCl reaction, some shell frags. (.25cm)

SP - olive gray sand, poorly graded, 85% med. sand, 10% f. sand, 5% clay and silt, soft, moist, homog.

SP - gray sand, poorly graded, 85% f. sand, 10% med. sand, 5% silt and clay, loose, moist, micac., homog., shell frags.

ML - olive gray silt, 90% silt, 5% clay, 5% f. sand, hard, moist, homogeneous, shell frags.

SP - gray sand, poorly graded, 85% f. sand, 10% med. sand, 5% silt and clay, soft, moist, micac., homog.

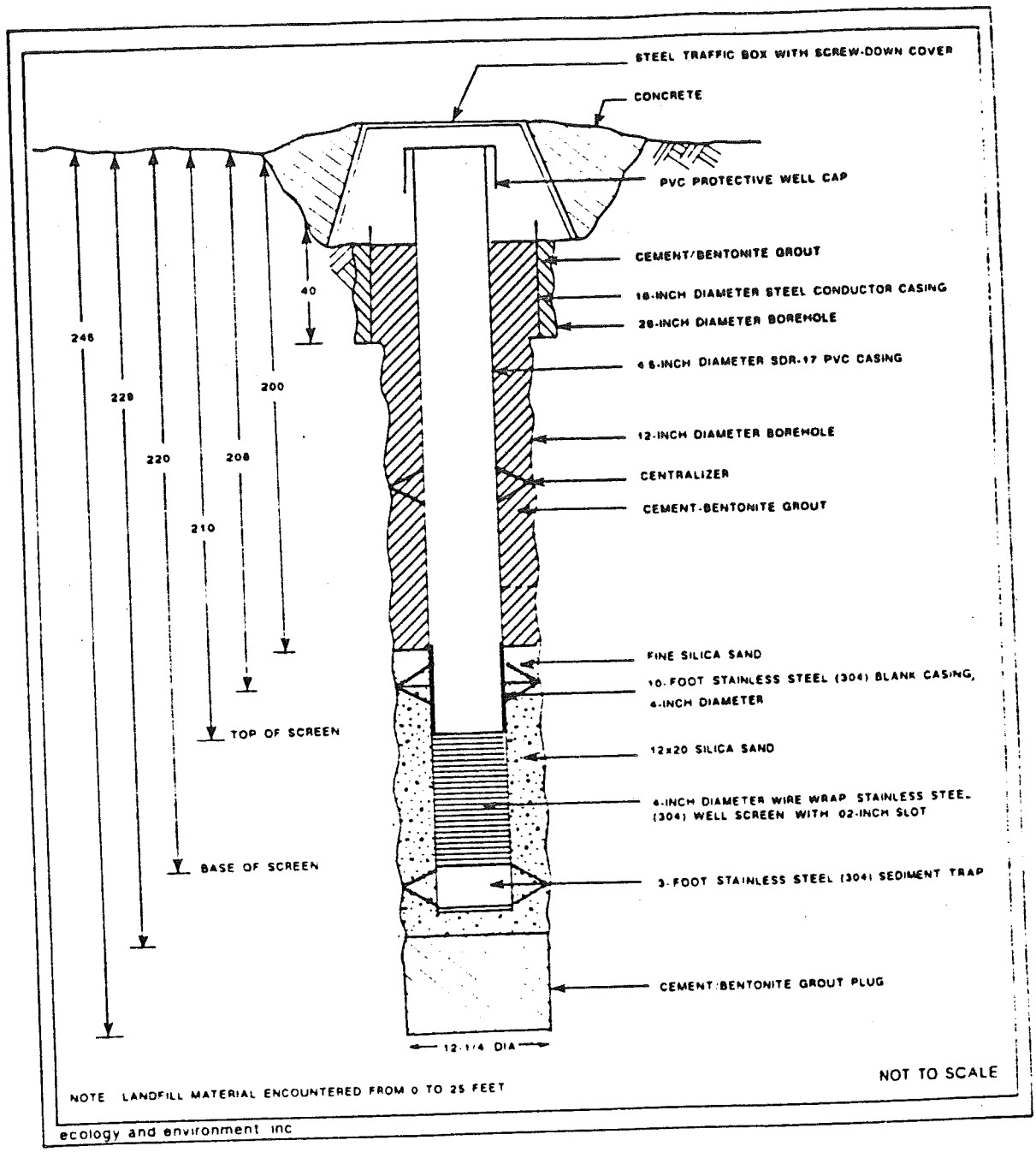
Total Depth of Borehole = 398 feet

BAT sample collected from DA-1A
BAT sample attempted, but not collected from DA-1A
BAT sample collected from DA-1C
BAT sample attempted, but not collected from DA-1C

ecology and environment, inc.

DEL AMO ESI
TORRANCE, CA

FIGURE A-18 CONT



MONITOR WELL SCHEMATIC DIAGRAM : DA-1B
DEL AMO SITE
TORRANCE, CALIFORNIA

FIGURE A-19

LOG OF WELL NO. 806 C

FROM	TO	CLASSIFICATION OF MATERIALS
0	11	Clay, dark gray with brown spots max. ¼", firm caliche nodules to ½", hard scattered straw filaments.
11	15	Sandy clayey silt; brown; 20% medium grained well sorted loose sand
15	19	Silty clay; olive-brown with rust brown streaks about ¼" long; firm, friable when dry.
19	53	Clayey silt, some fine sand, mottled tan and gray, some mica at 42'; few decomposed shells
53	56	Very silty fine sand; tan; loose; 30% gravel ¼"-2"; 10% fragments of shells; cons.: rock mica (biotite)
56	60	Gravel; clean, ⅛"-½", moderately well sorted; 10% shell fragments.
60	62	Large gravel made up of cemented shells. Pebble size to 3". Pitted
62	64	Very silty fine sand, tan; 30% ± ¼" to 1½; loose. Biotite present.
64	66	Cemented shells up to 3" pebbles. Pitted. 5% silt and fine sand.
66	68	Sand, fine to medium, some silt; pieces of cemented sandstone; shells.
65	72	Gravel made of ¼" pieces of cemented sand; shell fragments.
72	88	Medium to coarse sand, some fine 20% ± ¼" cemented sand egg-egations, numerous sand size shell fragments. At 81' only few sand eggregations, at 84' color change to gray.
88	96	Sand, fine to medium, 10% ± coarse, medium olive gray, shell fragment
96	99	Clayey silt grading to silty clay, olive with minute orange streaks, some embedded shells.
99	106	Clay, dark greenish gray, few sand stringers, few shells.
106	112	Silt, sandy, clayey, firm, dark greenish gray; numerous shells.
112	118	Clayey silts and silty sands interbedded, gray; fossils.
118	125	Sand and silt, very fine, gray, probably friable
125	132	Sand, very fine, loose, gray, much biotite mica.
132	142	Sand, fine to medium, loose, well sorted, much mica, few shell fines, gray.
142	158	Sand, fine, loose, much mica, gray.
158	164	Sand and silt, fine, loose, gray; with carbon matter.
164	165	Sand, medium, gray, with many shells and pieces.

Not perforated.

56'

806 C

ELEV

25 14

14 10

10 6

6 -20

-20 -31

-31 -35

35 -37

37 -39

-39 -41

41 -43

43 -47

ELEV

-47 -63

-63 SAND -71

ELEV -71 -74

-74± -81 CLAY

-81 -87

-87 -93

115' TOPO CHECK

-97 TOPO ELEV -93

-100 -107

-107 -117 SAND

-117 -133

-133 -138

-138 -140

165' TOPO

FIGURE A-20

806

78W348 108 REV. 6-2-55

SHEET 1

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT
HYDRAULIC DIVISION
WELL DATA

Owner: L.A.C.F.C.D. 0.3± mile No. of Carson St.

Location and Description: 600±E. of Normandie Ave; 50'± No. of 212 St. Storm Drain produced
637' E. of ℄ Normandie Ave;
42.2' N. of ℄ proposed LACFCD easement ℄ R/W; 27' E.-S.E. of F.C. monument } 3-26-59

Use: G.W. Observation

Elev. of average grd. at well ~~18~~ 25.1 U.S.G.S. Datum

Elev. of grd. adjacent to well U.S.G.S. Datum

Water surface reference points:

(a) From 10-1-'56 To Elev. 20.5 How det. topo.
Description: Top of capped casing, 2.5' above grd.

(b) From 4-17-59 To Elev. 20.5 How det. Rel. to R.P.a)
Description: ½" slot in side of extended well casing (same level as R.P.a)). Casing extend 11.43 topped with hinged lid.)

(c) From 10-1-59 To Elev. 27.88 How det. Rel. to R.P.a&b)
Description: Top of casing with hinged lid. 2.5' above grd.

(d) From 9-14-61 To 9-21-7? Elev. 24.4' How det. LAC F.C. map F.C. # 299-F62
Description: Top of 8" casing, 0.7 ft below top of ground & top of dirt roadway

*(e)

Type of well: Cable Tool Size 8"

Original depth: 165' Soundings: 159.5 11-10-59; 171' - 11-9-59

Pumping equipment: None

Power used:

Capacity: Drawdown:

Date drilled: 10-1-'56 By Peck & Son

Artesian characteristics:

Quality of water:

Remarks: R.P.'s 9-22-61 elev. 25.6' [illegible]
[illegible] casing extended 1.2 ft above R.P. [illegible]
2.5 ft. above ground.
~~* R.P. e Top of~~

(over)

Well Numbers | Owner: NC 1 | D.W.R. | D.W.R. | F.C. 806 C

FIGURE A-21

BOE-C6-0184854

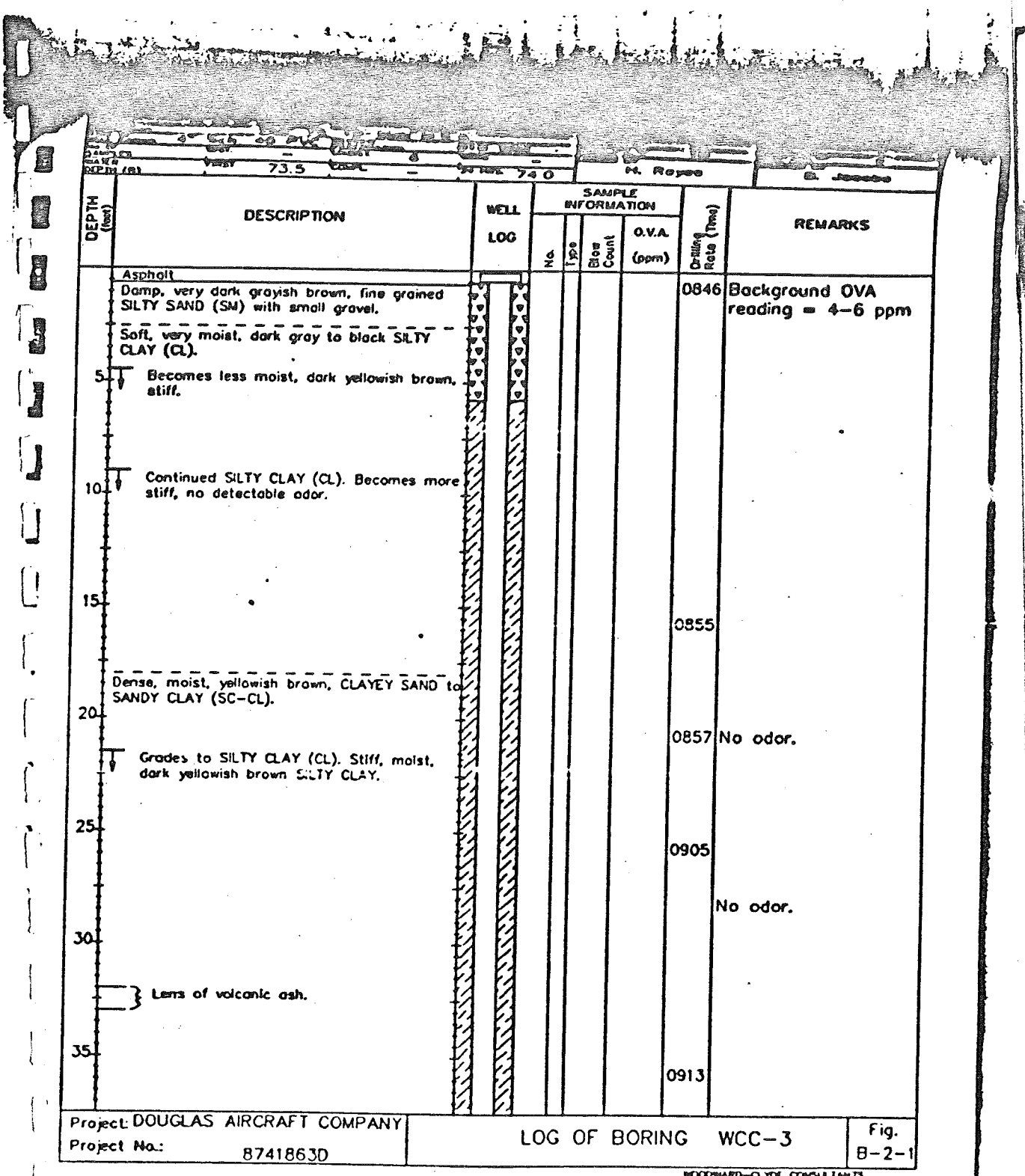


FIGURE A-22

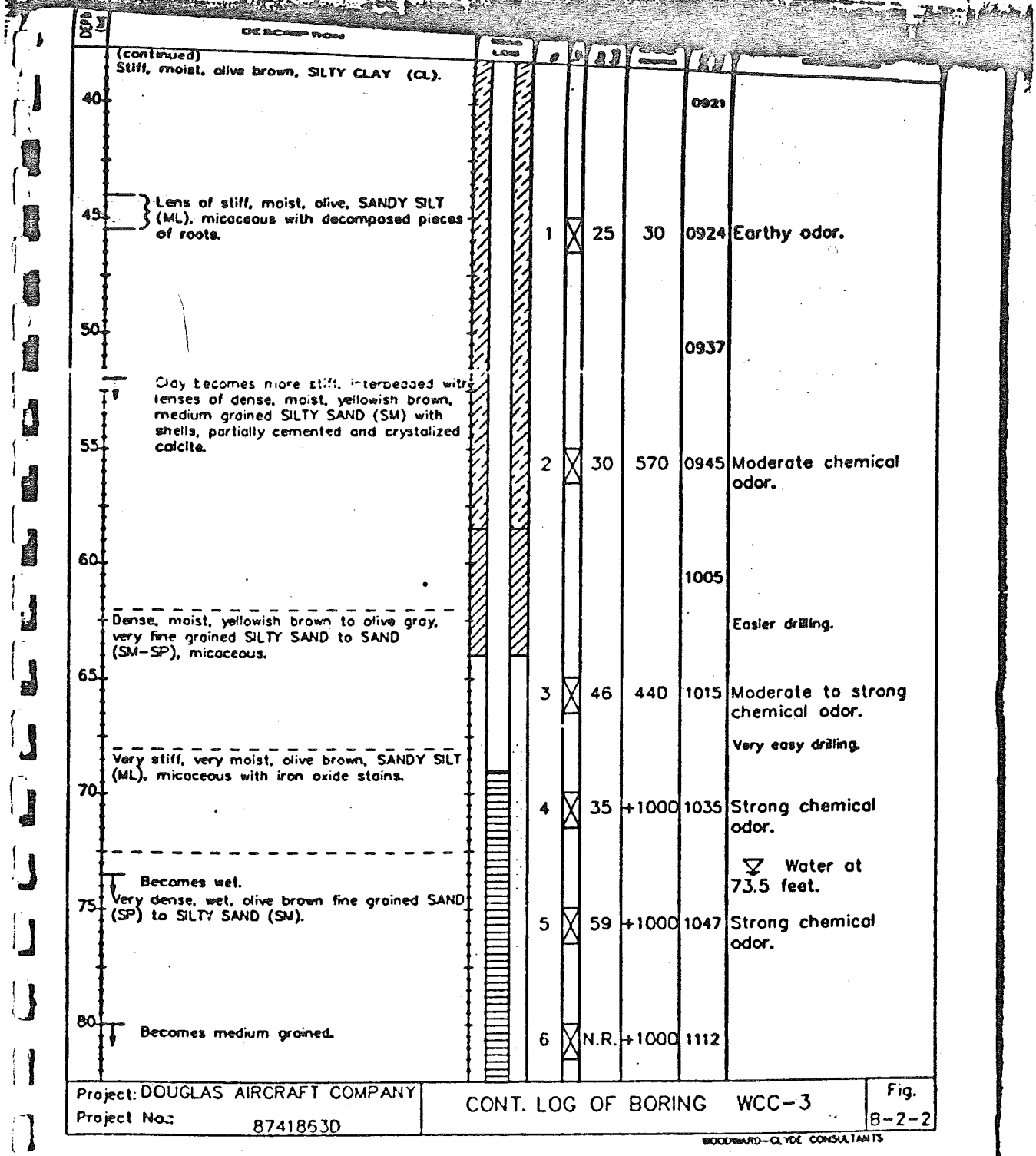


FIGURE A-22 CONT

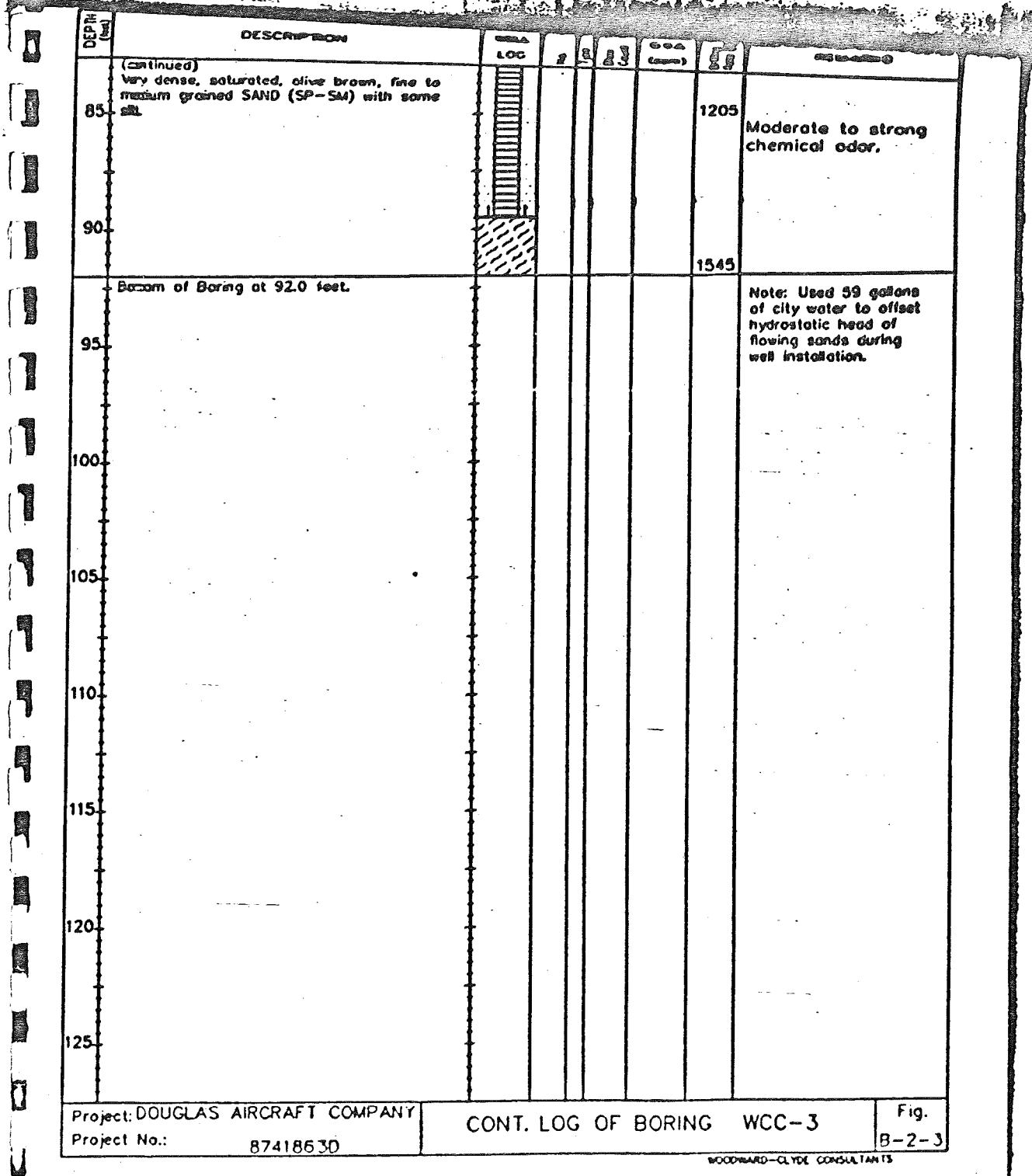
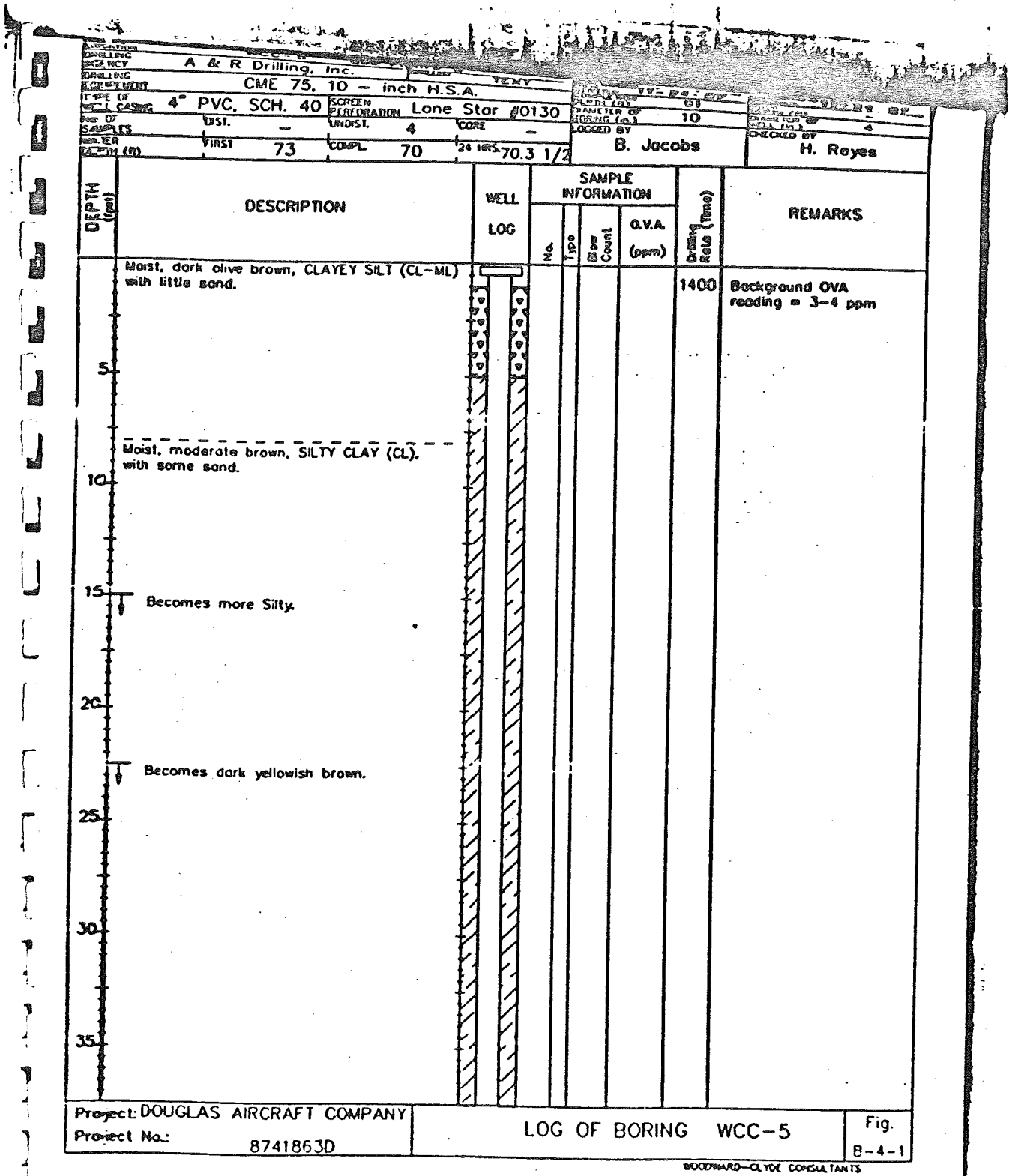


FIGURE A-22 CONT



DRILLING CONTRACTOR	A & R Drilling, Inc.
DRILLING EQUIPMENT	CME 75, 10 – inch H.S.A.
TYPE OF CASING	4" PVC, SCH. 40
SCREEN PERFORATION	Lone Star #0130
DIST.	–
UNDIST.	4
CORE	–
WATER DEPTH (ft) FIRST	73
COMPL	70
24 HRS.	70.3 1/2
DRILLER(S)	B. Jacobs
BORING (no.)	10
LOGGED BY	B. Jacobs
CHECKED BY	H. Reyes

DEPTH (feet)	DESCRIPTION	WELL LOG	SAMPLE INFORMATION No.	Type	Blow Count	O.V.A. (ppm)	Drilling Rate (Time)	REMARKS
0	Moist, dark olive brown, CLAYEY SILT (CL-ML) with little sand.						1400	Background OVA reading = 3–4 ppm
5								
10	Moist, moderate brown, SILTY CLAY (CL). with some sand.							
15	Becomes more Silty.							
20								
25	Becomes dark yellowish brown.							
30								
35								

Project: DOUGLAS AIRCRAFT COMPANY
Project No.: 8741863D

LOG OF BORING WCC-5

Fig. B-4-1

WOODWARD-CLYDE CONSULTANTS

FIGURE A-23

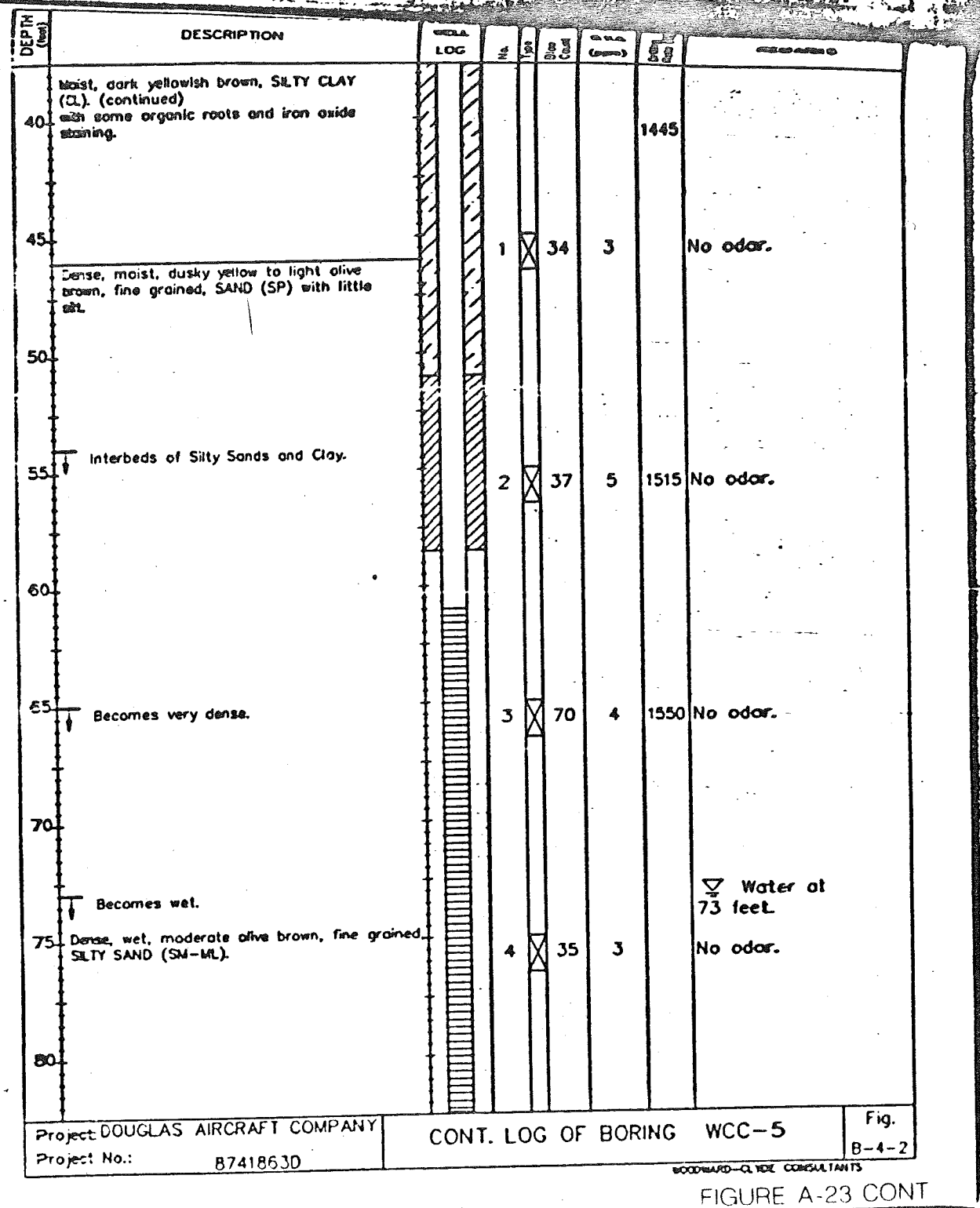


FIGURE A-23 CONT

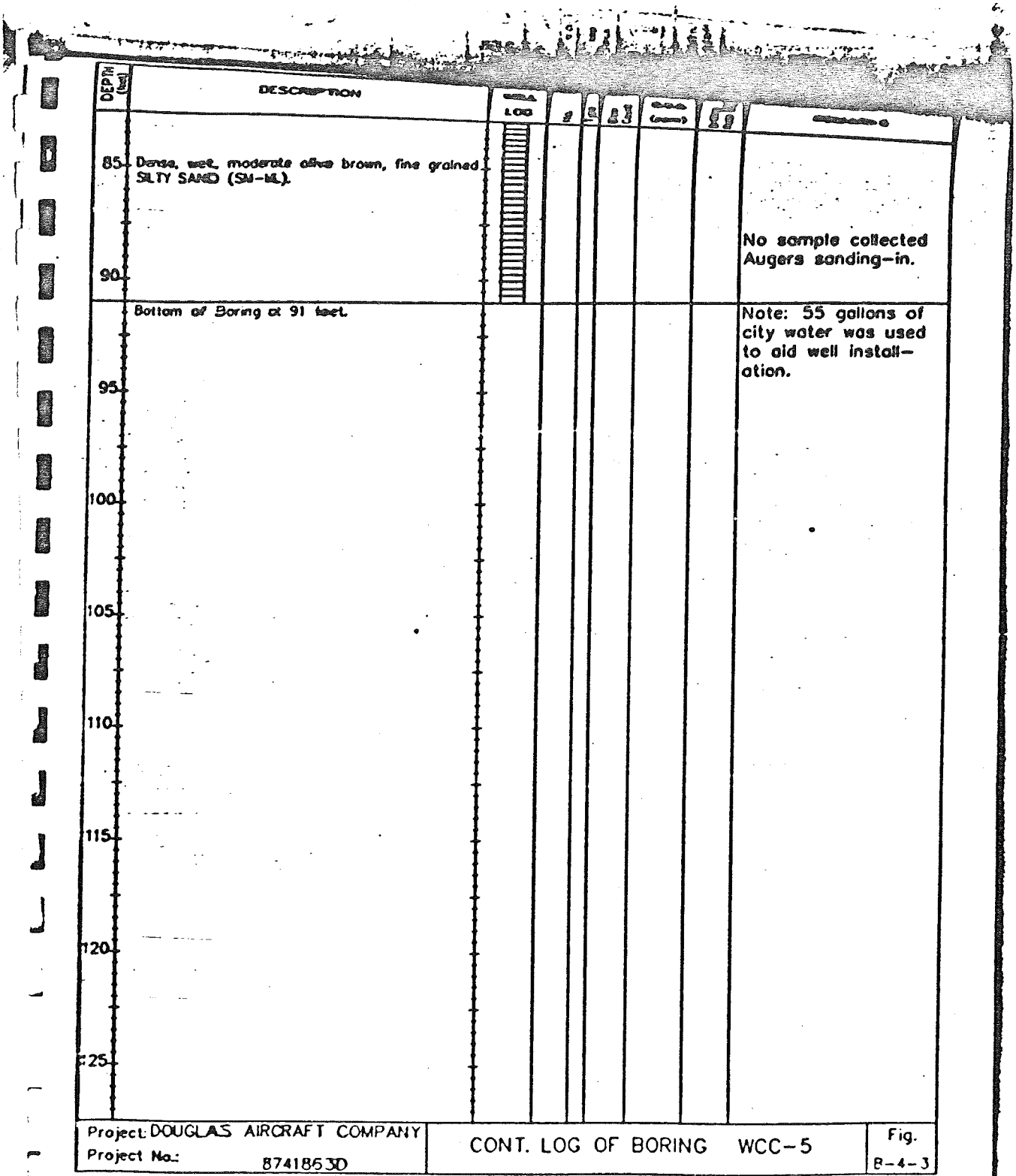


FIGURE A-23 CONT

APPENDIX B

GROUNDWATER SAMPLING FORMS

APPENDIX B

TABLE OF CONTENTS

Table	
B-1	WELL SPECIFICATIONS
B-2	HYDROGEOLOGIC DATA AND WATER QUALITY DATA

TABLE B-1

WELL SPECIFICATIONS

WELL IDENTIFIER:_____

General Information:

Owner Operator_____

Location_____

Site Description/
History of Operation_____

_____

_____

Well Use_____

Drilling Specifications:

Date Drilled_____

Total Depth Drilled_____

Drilling Technique_____

Borehole Diameter_____

Attachments:

Lithologic Logs	Y	N
Geophysical Logs	Y	N
Well Construction Schematic Diagram	Y	N
Water Quality Data	Y	N
Sampling Schedule	Y	N

Well Construction Specifications

Total Depth Conductor Casing
(if applicable)_____

Perforation Type and Size_____

Total Depth of Casing_____

Casing Diameter_____

Casing Type/Material_____

Screened Interval_____

Pump Type_____

Pump Set Depth_____

Proposed Purging and Sampling Method:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

TABLE B-2

HYDROGEOLOGIC DATA AND WATER QUALITY DATA

WELL IDENTIFIER _____

DEPTH TO WATER _____

MEASURING POINT (ELEVATION) _____

REFERENCE POINT (ELEVATION) _____

CASING VOLUME CALCULATIONS _____

ESTIMATED HYDRAULIC CONDUCTIVITY _____

LABORATORY _____

ANTICIPATED DISCHARGE RATE _____

ANTICIPATED PURGE VOLUMES _____

PUMPING WATER LEVELS _____

WATER LEVEL RECOVERY DATA _____

DATES SAMPLED _____

ANALYTICAL METHODS _____

PRIMARY CONSTITUENTS DETECTED:	[CONCENTRATIONS]	[UNITS]

TARGET CHEMICALS DETECTED:	[CONCENTRATION]	[UNITS]